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Plant Breeding Abstracts

Vol. XXXI, No. 3

STATISTICS

2846 Weiling, F.
Vereinfachte Prüfung der Additivität bei Streuungszerlegungen (Varianzanalysen). **(A simplified test for additivity in variance analyses).**
Züchter 1960 : **30** : 269–72.

A simplification of the Tukey test for single and double variance analyses is presented. For multiple variance analysis the additivity is estimated from the interaction, which is not significant when there is an additive effect. The Latin square is the only case in which the general form of the Tukey test is needed.

2847 Schulze, J.
Das Rechteckgitter. **(The rectangular lattice).**
Wiss. Z. Humboldt-Univ. Berlin 1959/60 : **9** : 479–91.

The rectangular lattice with the treatment number $k(k + 1)$ forms a useful supplement to lattice designs with k^2 treatments. It may be constructed as a simple or triple rectangular lattice with or without repetition of the basic design, also as a near-balanced and a Latinized rectangular lattice. The construction types and statistical analysis of the different types are described, with examples, and 14 layouts are given in an appendix.

2848 Specht, G. & Müller, K.-H.
Probleme bei der Durchführung von Grossflächenstreuversuchen. **(Problems in carrying out large-scale scattered trials).**
Z. landw. Vers.-UntersuchWes. 1960 : **6** : 148–65.

Mention is made of the kinds of problem which are best solved by means of trials with large plots, and methods of carrying out such trials are discussed with reference to experiments performed in Hungary.

2849 Sváb, J.
Zur Methode der Grossflächen-Streuversuche: Meinungsforschung. **(The method of large-scale scattered experiments: subjective research).**
Z. landw. Vers.-UntersuchWes. 1960 : **6** : 182–91.

[Cf. XXX, 145 and XXXI, 174].*

2850 Kishen, K.
On a class of asymmetrical factorial designs.
Curr. Sci. 1960 : **29** : 465–66.

Further to an earlier paper on the construction of asymmetrical factor designs [XXIX, 3337], the author enumerates optimum and most efficient designs for the class $q \times 2^2$.

GENETICS

2851 Cockerham, C. C.
Implications of genetic variances in a hybrid breeding program.
Crop Sci. 1961 : **1** : 47–52.

This study considers the covariances, in terms of genetic variances, between all possible pairs of relatives among single, three-way and double crosses. These are then applied to a consideration of the type of cross within which to select, the amount of inbreeding needed in the parent lines and the importance of the order in which the lines are combined. Some alternative selection and breeding procedures are discussed.

2852 Bernet, J., Esser, K., Marcou, D. & Schecroun, J.
Sur la structure génétique de l'espèce *Podospora anserina* et sur l'intérêt de cette structure pour certaines recherches de génétique. **(The genetical structure of *P. anserina* and the interest of this structure with respect to certain genetical studies).**
CR Acad. Sci., Paris 1960 : **250** : 2053–55.

Cultures from wild perithecia growing adjacent to each other belonged to a single genetic type in which the only detectable heterogeneity was in mating type, the ascus being heterozygous at the +/− locus. All cultures grown from perithecia from separate localities were, however, genetically different; although morphologically fairly similar, they differed in longevity when allowed to reproduce vegetatively and generally formed "barrages" when mated to each other. Such barrages are genetically or cytoplasmically conditioned and are in some cases accompanied by a marked lowering of fertility in one or both of the reciprocal crosses. In other cases the crosses are fertile but lethal genes segregate in the progeny; these are

* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

termed synthetic lethals, since their effect arises through recombination. Since the incompatibilities between cultures correspond to interspecific incompatibilities in other organisms, it is thought that this species may be of use in studying the nature of interspecific differences.

2853 CLELAND, R. E.
The S-factor situation in a small sample of an *Oenothera* (*Raimannia*) *heterophylla* population.
Z. VererbLehre 1960 : **91** : 303–11.

Plants grown from the seed of "two or three" individuals taken from an extensive population carried a total of six *S* alleles. It is concluded that the number of different *S* alleles in the population as a whole is probably very large and that this greatly increases the likelihood of successful pollinations among the individuals of this self-incompatible species.

2854 STOCKER, B. A. D., MCDONOUGH, M. W. & AMBLER, R. P.
A gene determining presence or absence of ε-N-methyl-lysine in *Salmonella* flagellar protein.
Nature, Lond. 1961 : **189** : 556–58.

Evidence was obtained in support of the view that only 20 different base groups (corresponding to the 20 common aminoacids) occur in DNA, since the genetically determined presence or absence of an uncommon aminoacid (N-methyl-lysine) in a particular protein (flagellar protein) was dependent on a gene other than the one conditioning the aminoacid sequence of this protein.

2855 COCITO, C. & HERSHEY, A. D.
Transfer of DNA-glucose from parental to offspring phage T2.
Biochim. biophys. Acta 1960 : **37** : 543–44.

Labelled glucose was found to be transferred from parent to offspring phage with the same efficiency as other DNA constituents, such as phosphorus, purines and pyrimidines.

2856 SCHARLOO, W.
Temperature and mutant expression.
Experientia 1961 : **17** : 121–22.

Experiments on the expression of the gene ci^D (*a*) at 20° and 25° C. in three wild stocks of *Drosophila melanogaster* and (*b*) at 15°, 25° and 30° C. in one of the wild stocks and two stocks selected from it for high and low expressivity showed that changes in expression due to temperature were not determined by the ci^D gene but were wholly dependent upon the genetic background.

2857 LEWIS, D.
Genetical analysis of methionine suppressors in *Coprinus*.
Genet. Res. 1961 : **2** : 141–55.

A unique case of long-distance noncomplementation between alleles at different loci in *C. lagopus* is reported and discussed in terms of the possible nature of gene action. Although two suppressor genes were 28 units apart, they did not complement one another.

2858 TRAUTNER, T. A.
The influence of the multiplicity of infection on crosses with bacteriophage T1.
Z. VererbLehre 1960 : **91** : 259–65.

The results of two-factor and three-factor crosses with phage T1 demonstrate that as infection titre (IT) increases there is an increase in recombination percentages up to a maximum beyond which the percentages decrease. It is considered that the best explanation of these results is provided by a "topography" model which assumes that, after penetration of phage DNA into the cell, an "area" is formed within which this particular phage multiplies. Upon infection of the cell with many phages there will be many such areas and only in mixed areas of genetically different phages will recombinant-producing "cooperations" occur; the higher the IT, the higher will be the number of mixed areas. According to this model, recombination between two markers would depend not only on the marker distance but also on the ratio of mixed to mixed + unmixed areas. The falling off of recombination percentages after the maximum level has been reached is thought to be due to secondary effects.

2859 HAUSMANN, R. & BRESCH, C.
Zum Problem der genetischen Rekombination von Bakteriophagen. II. Versuch einer experimentellen Unterscheidung von paarweiser und kompletter Kooperation. (**The problem of genetic recombination in bacteriophages. II. An attempt at an experimental differentiation of pairwise and complete cooperation**).
Z. VererbLehre 1960 : **91** : 266–76.

The results of studies of triparental crosses support the "topography" interpretation of phage genetics [cf. 2858], no conclusive evidence being obtained as to whether or not the process of cooperation is restricted to two parental structures. [Cf. XXIX, 57].

2860 Joussen, H. & Kemper, J.
Ein neues Interferenzmodell zur Aufstellung von Tetraden-Kartierungsfunktionen. (**A new interference model for the formation of tetrad mapping functions**).
Z. VererbLehre 1960 : **91** : 350–54.
The mathematical model described has some advantages over that of Barrett *et al.* [cf. XXV, p. 101]. It is characterized by an interference factor i which indicates the inhibition of a second or further crossing over. Interference may be evaluated in a two-point test cross.

2861 Stephens, S. G.
Species differentiation in relation to crop improvement.
Crop Sci. 1961 : **1** : 1–5.
Based on parental chromosome pairing and recombination, four groups of interspecific hybrids representing four broad levels of differentiation are recognized. The different technical problems that these present to the breeder are discussed with reference to published studies by the author and others on wheat, potato, cotton, tobacco and tomato.

2862 Piza, S. de T. (Jun.).
O gen tal como veio e tal como se foi. (**The gene as I see it and as it was**).
Rev. Agric., Piracicaba 1960 : **35** : 155–60.
Mention is made of the disservice to science on the part of Nägeli in not recognizing the results of Mendel. The development of the chromosome theory of inheritance is outlined and the author reaffirms his conviction that the true unit of heredity is the chromosome rather than the gene.

2863 Piza, S. de T. (Jun.).
Os mapas cromossômicos não provam a realidade dos gens. (**Chromosome maps do not prove the reality of genes**).
Rev. Agric., Piracicaba 1960 : **35** : 227–37.
In support of the argument it is pointed out that though the existence of chromosomes in bacteria or viruses had not been demonstrated, geneticists were happy to construct linkage maps for these organisms. Crossing over, it is submitted, can be explained by interchange of portions of the chromosomes. The fact that nuclei have been shown to undergo differentiation as well as the cytoplasm also points towards the functioning of the chromosome as a unit rather than as a string of independent genes.

2864 Jacob, F., Perrin, D., Sanchez, C. & Monod, J.
L'opéron: groupe de gènes à expression coordinée par un opérateur. (**The operon: a group of genes whose expression is coordinated by an operator**).
CR Acad. Sci., Paris 1960 : **250** : 1727–29.
Previous work has shown that in the synthesis of certain proteins two types of gene are involved, viz. one determining the structure of the molecule and the other regulating the expression of the first by means of a repressor [cf. XXX, 2191]. Every regulatory gene so far found has a pleiotropic effect, governing the expression of a series of closely linked genes which correspond to protein-enzymes all belonging to the same biochemical sequence. It is supposed that there is an operator gene, which is adjacent to the group of genes, governs their activity and is sensitive to the repressor produced by a regulator gene. This would mean that: (*a*) certain mutations affecting the operator would result in a loss of the ability to synthesize all the proteins determined by the linked group; and (*b*) other mutations involving, say, a loss in sensitivity of the operator towards the repressor would be revealed through the constitutive synthesis of the proteins determined by the linked genes. Such constitutive mutants would be dominant in a diploid heterozygote, but their effect would only be apparent in genes which are in the *cis* position with respect to the mutated operator. Such a system is described for the genetics of production of galactoside permease and β-galactosidase in *Escherichia coli*.

2865 Harm, W.
Vergleichende Untersuchungen an HNO_2-inaktivierten und UV-inaktivierten Bakteriophagen T4. (**Comparative investigations on HNO_2-inactivated and UV-inactivated bacteriophage T4**).
Z. VererbLehre 1960 : **91** : 52–62.
Inactivation of phage T4 by nitrous acid is essentially an exponential function of the time of treatment. Multiplicity reactivation and marker rescue are less than after ultraviolet irradiation. Survival of the phenotypic function of the cistrons *r II–A* and *r II–B* is also lower than after ultraviolet irradiation with a corresponding number of hits. It is assumed that lethal hits blocking early stages of infection occur, amounting to about $\frac{1}{6}$ of the total hit number. There is some indication that early

damage occurs in the protein but at least $\frac{5}{6}$ of the lethal hits are due to changes within DNA.

2866 Trautner, T. A.
Das Verhalten nitritinaktivierter T1-Phagen in Kreuzungs- und Multiplizitätsreaktivierungs-Versuchen. (**The behaviour of nitrite-inactivated T1 phages in cross and multiplicity reactivation experiments**).
Z. VererbLehre 1960 : **91** : 300–02.

The percentage of recombination increased with the dose of nitrite administered; multiplicity reactivation occurred with inactivated phages.

2867 Lacks, S. & Hotchkiss, R. D.
A study of the genetic material determining an enzyme activity in *Pneumococcus*.
Biochim. biophys. Acta 1960 : **39** : 508–17.

"An enzyme of *Pneumococcus* responsible for the conversion of maltose to glucose and oligosaccharides was investigated. The genetic analysis of a group of mutants lacking this enzyme was accomplished by studying DNA-mediated transformations of the different strains.
"Transformation of the different mutants to maltose utilization by wild-type DNA occurred with different frequencies. Recombination of genetic material of the maltose negative strains also gave rise to positive cells. Analysis of the recombinations indicated that the regions corresponding to the different markers are linked and arranged in a linear fashion. Some larger regions overlapped several smaller ones indicating that single mutations altered regions in the genetic material of different size.
"Heating the DNA used in transforming the mutant strains destroyed most rapidly the ability to transform the factors corresponding to the larger genetic regions. Factors corresponding to smaller regions were inactivated less rapidly. This is taken to indicate that a DNA molecule partly denatured by heat still retains part of its genetic activity.
"It is concluded, furthermore, that genetic properties of markers, such as size, linkage, and discreteness, are reflections of the actual distribution of determinants within DNA molecules." [Authors' summary].

2868 Lacks, S. & Hotchkiss, R. D.
Formation of amylomaltase after genetic transformation of *Pneumococcus*.
Biochim. biophys. Acta 1960 : **45** : 155–63.

"Transformation of mutant strains of pneumococcus which lack the enzyme amylomaltase with DNA from a wild strain which can produce the enzyme, results in the rapid formation of amylomaltase in the recipient cells. Within 10 min., a small fraction of the generation time, the enzyme is being produced at its maximal rate—as a constant proportion of new protein synthesized.
"When parallel cultures of different mutant strains are transformed, although the cells are believed to take up the same amounts of DNA, the rate of formation of amylomaltase is proportional to the extent of permanent genetic change, which is different for the different recipient populations. This suggests that DNA must not only be incorporated but must be permanently integrated in the cell in order to elicit enzyme synthesis.
"Transformation of a mutant strain with DNA from another strain mutated at a different but linked site, also results in the rapid formation of amylomaltase. In this case enzyme formation requires that donor DNA interact with host DNA, probably by some form of genetic recombination.
"Thus, in the process of transformation, it appears that integration, recombination, and probably replication of newly-introduced DNA, as well as its elicitation of specific protein synthesis, occur very soon after entry of the DNA into the cell." [Authors' summary].

2869 Lerman, L. S. & Tolmach, L. J.
Genetic transformation. I. Cellular incorporation of DNA accompanying transformation in *Pneumococcus*.
Biochim. biophys. Acta 1957 : **26** : 68–82.

"The incorporation of ^{32}P-labeled DNA by pneumococcal cells undergoing genetic transformation has been studied. While acceptability for incorporation is not limited to genetically active DNA nor to pneumococcal DNA, neither RNA nor severely degraded DNA are significantly incorporated. The frequency of transformation among cells presented with genetically active pneumococcal DNA is directly proportional to the amount of DNA incorporated. The proportionality holds upon variation of any of a number of experimental conditions, including temperature and duration of exposure, concentration of DNA, and presence of inhibiting DNA. The quantitative relationships indicate that only a fraction of the incorporated DNA may be functional in the usual sense; about 2–10 times the normal cellular content of DNA is incorporated per transformation to streptomycin resistance. They also suggest that the DNA is first bound in a temporary, perhaps superficial state, from which either

expulsion or permanent incorporation proceeds. Slight previous degradation by DNase reduces incorporation and genetic activity at different rates, the latter much more rapidly."

[Authors' summary.]

2870 Lerman, L. S. & Tolmach, L. J.
Genetic transformation. II. The significance of damage to the DNA molecule.
Biochim. biophys. Acta 1959 : **33** : 371–87.

"The loss of capacity of pneumococcal DNA to effect transformation as the result of exposure to several degradative agents has been studied, together with the concomitant decline in cellular incorporation of the treated DNA. The results indicate a one-hit process for the loss of genetic activity, and are in accord with the hypothesis that cellular incorporation reflects the number average molecular weight of the DNA. On this basis it has been possible to define the length of a critical DNA segment essential to genetic activity. Its value for the traits studied is about 8% of the intact molecule.

"Treatment by heat or ultraviolet yields multicomponent inactivation curves. The former appears to be the result of two easily distinguishable processes. Of all the agents tested, only ultraviolet discriminates between the optochin and streptomycin resistance markers. The quantum yield for ultraviolet inactivation has been calculated." [Authors' summary].

2871 Kohiyama, M. & Saito, H.
Stimulation of genetic transformation in *Bacillus subtilis* by biologically inactive DNA and polyphosphate.
Biochim. biophys. Acta 1960 : **41** : 180–81.

Biologically inactive DNA was applied to $160s^r$, a tryptophane-dependent mutant of *B. subtilis* 'Marburg'. Transformants appeared after a 5–15 min. lag period, and increased in a linear manner with time. Transformation was also stimulated by the application of sodium polyphosphate at a concentration of 18 μg./ml.

2872 Shamoian, C. A., Canzanelli, A. & Melrose, J.
Back-mutation of a *Neurospora crassa* mutant by a nucleic acid complex from the wild strain.
Biochim. biophys. Acta 1961 : **47** : 208–11.

A DNA–RNA preparation, obtained from a wild strain of *N. crassa*, induced the back transformation of a pyrimidine-requiring mutant to the pyrimidine-independent form.

2873 Gilbert, N.
Polygene analysis.
Genet. Res. 1961 : **2** : 96–105.

The assumptions commonly made in polygenic analysis are critically examined. It is shown, in particular, that the use of scaling tests and an additive model of the type $(a + x)$ is not reliable, nor is the usual method of estimation, based on variances, robust, nor are F_0–F_2 and BC data adequate for the types of estimate commonly made from them.

As an alternative, the author proposes a model of the type $(a + x)\theta^x$ and a method of estimating genetic components from F_0–F_3 and BC data, using means rather than variances.

2874 Marçallo, F. A. & Freire-Mala, N.
New recurrent series in inbreeding phenomena.
Nature, Lond. 1961 : **189** : 421–22.

It is shown that oscillatory values which rapidly approach a limiting value of 4/3 are obtained when the ratio mean coefficient of inbreeding for sex-linked genes/Wright's coefficient of inbreeding for autosomal genes is plotted against degree of consanguinity.

2875 Kolman, W. A.
The mechanism of natural selection for the sex ratio.
Amer. Nat. 1960 : **94** : 373–77.

"A population model is presented which quantifies and extends the mechanism described by R. A. Fisher for the natural selection of the sex ratio. It is shown how the sex ratio should adjust so that the total parental expenditure on the production of males is equal to the total expenditure on the production of females, and that this mechanism can affect the mean of a population's sex ratio, but not the variance."

[Author's summary].

2876 Menke, W.
Über ein Modell der Plastidenmutation.
(A model of plastid mutation).
Z. VererbLehre 1960 : **91** : 152–57.

Both gene mutations and plastid mutations may be responsible for defects of plastids. The plastid mutations are irreversible and their frequency is not increased by X irradiation. Genes allelic to those controlling normal development of plastids increase the frequency of plastid mutation.

It is suggested that for the synthesis of structural elements of the plastids, not only enzyme and substrate must be present but also a small

quantity of the reaction product as a starter. A mutation of the gene responsible for enzyme formation may result in a lack of the reaction product and daughter plastids without it may also arise by division; these plastids are unable to synthesize the reaction product even when they come under the influence of the nonmutant genome in crosses. A spontaneous mutation of a plastid may occur during division if by chance one of the daughter plastids does not receive the starter.

2877 Barnetzky, F.
Über die Einrichtung einer Röntgenbestrahlungsanlage für Saatgut. (**The setting up of an X-irradiation installation for seed**).
Kulturpflanze, Berlin 1960 : **8** : 222–29.
The adjustment of X-ray therapy equipment for seed irradiation is described and suggestions are made for standardizing the conditions of irradiation.

2878 Casati, A.
Questioni di radiobiologia generale. 6. La "zona d'azione". (**Questions of general radiobiology. 6. The "zone of action"**).
Caryologia 1960 : **13** : 659–712.
Damage from irradiation is often found in groups of organelles or of cells, from which the author derives his concept of zones of action, where the initial products of the radiation effect are localized and from which they spread.

2879 Nakada, D., Strelzoff, E., Rudner, R. & Ryan, F. J.
Is DNA replication a necessary condition for mutation ?
Z. VererbLehre 1960 : **91** : 210–13.
When tryptophane-dependent (*try*$^-$) populations of *Salmonella typhimurium* were exposed to chloramphenicol (20 μg. per ml.) in the presence or absence of tryptophane (20 μg. per ml.), within 2 hr., there was a net increase of 50% in DNA content while RNA showed a three-fold increase. If 2-aminopurine (300 μg. per ml.) was present at the onset of synthesis, mutation to *try*$^+$ was induced; if added after synthesis had ceased, however, no mutation was detectable. The number of *try*$^+$ mutants obtained was slightly less than half of that obtained when complete DNA replication was allowed to occur. Under these conditions, therefore, the synthesis of nucleic acid is required for the induction of mutation while protein synthesis is not.
When cells treated for 2 hr. with chloramphenicol and 2-aminopurine were washed and suspended in a minimal medium, it was found after a further 2 hr. that DNA content had increased by only 3%, protein had decreased by 16% and only 66% of the RNA remained. To account for the fact that a 50% increase in DNA content was sufficient to allow the occurrence of mutation and the expression of the mutant phenotype without further DNA synthesis in a minimal medium, it is assumed that the incorporation of 2-aminopurine provides the basis for tryptophane synthesis without further replication. If there is more than one mutable unit per cell, *try*$^+$ is dominant in a heterocaryon and the expression of the phenotype does not require a cell division.
Although it is concluded that DNA replication is necessary for the mutations observed under the conditions of these experiments, the possibility is not excluded that mutations may also be brought about by exchange reactions in the absence of DNA replication.

2880 Doudney, C. O. & Haas, F. L.
Chloramphenicol, nucleic acid synthesis and mutation induced by ultraviolet light.
Biochim. biophys. Acta 1960 : **40** : 375–77.
The addition of chloramphenicol to *Escherichia coli* 'WP2' immediately after ultraviolet treatment led to a marked reduction in the expected mutation frequency. However, the treatment had no effect on subsequent DNA synthesis in the culture. Lieb's contention [cf. 2883] that chloramphenicol causes a lowered mutation-frequency response through delay of DNA synthesis is not considered plausible. It is suggested that blockage of protein synthesis promotes an active "mutation-frequency decline" process [cf. XXVIII, 3709 and XXIX, 3421].

2881 Mundry, K. W.
Mutationsuntersuchungen am Tabakmosaikvirus *in vitro*. I. Die Abhängigkeit des Erfolgs der Mutagenese mit HNO_2 von der Mutationsrichtung.
(**Mutation studies on tobacco mosaic virus *in vitro*. I. The dependence of the success of mutagenesis with HNO_2 on the direction of mutation**).
Z. VererbLehre 1960 : **91** : 81–86.
A nonnecrotic strain of this virus was incubated with nitrous acid and a marked increase was noted in the frequency of mutants causing necroses on Java tobacco. Deamination by

nitrous acid did not influence the occurrence of back mutations in two spontaneous mutants causing necroses.

2882 MUNDRY, K. W.
Mutationsuntersuchungen am Tabakmosaikvirus *in vitro*. II. Versuche zum Problem der Mutagenese durch UV-Bestrahlung reiner Viruspräparate. **(Mutation studies on tobacco mosaic virus *in vitro*. II. Experiments on the problem of mutagenesis UV irradiation of pure virus preparations).**
Z. VererbLehre 1960 : **91** : 87–93.
Nucleoprotein of the virus was subjected to ultraviolet irradiation *in vitro* and tested on Java tobacco; the treatment had no mutagenic effect.

2883 LIEB, M.
Deoxyribonucleic acid synthesis and ultraviolet-induced mutation.
Biochim. biophys. Acta 1960 : **37** : 155–57.
Factors influencing the frequency of mutation in a tryptophane-requiring culture of *Escherichia coli*, subjected to ultraviolet rays, have been studied. Results indicated that chloramphenicol, when present in the posttreatment medium, reduced mutation frequency by delaying DNA synthesis.

2884 BÖHME, H.
Streptomycin-abhängige Mutanten von *Proteus mirabilis* und ihre Verwendung in Mutationsversuchen mit Manganchlorid. **(Streptomycin-dependent mutants of *P. mirabilis* and their utilization in mutation experiments with manganese chloride).**
Biol. Zbl. 1961 : **80** : 5–32.
Streptomycin-dependent (str–d) strains derived from the streptomycin-sensitive strain VI gave rise to low frequencies of streptomycin-nondependent mutants. Tests with str–d–3 showed that mutant frequency can be increased by treatment with $MnCl_2$, the maximum effect being obtained by treatment of cells during the first part of the growth phase. The mutagenic effectiveness of $MnCl_2$ is completely inhibited if, prior to treatment, the bacteria are grown in a nutrient broth containing 20 mg./ml. yeast extract. Supplementation of the pretreatment growth medium with 300 γ/ml. each of adenosine and guanosine instead of yeast extract gave a half-maximum inhibition of mutagenic effect, indicating the possible role of nucleic acid precursors as $MnCl_2$ antimutagens. The ratio of prototrophic to auxotrophic revertants was not the same for $MnCl_2$-induced mutants as for spontaneous mutants, suggesting that two loci each controlling streptomycin nondependence differ in sensitivity to $MnCl_2$.

2885 ZAMENHOF, S.
Gene unstabilization induced by heat and by nitrous acid.
J. Bact. 1961 : **81** : 111–17.
"The treatment by heat (130 to 155 C) or by nitrous acid induces, in addition to stable mutants, unstable lactose fermentation mutants (*Escherichia coli*) and unstable auxotrophs (*E. coli* and *Bacillus subtilis*). Of these, the unstable fermentation mutants were detected as some of the sectored colonies on a convenient medium penassay-tetrazolium-lactose agar which also permits detection of mutants of intermediate content of β galactosidase. The back mutation rates of unstable auxotrophs were 10^{-1} to 4 x 10^{-2}; however, unstable strains can be maintained indefinitely and studied. The chemical action on deoxyribonucleic acid of mutagens producing gene unstabilization and the possible evolutionary significance of unstable genes have been briefly discussed."
[Author's summary].

2886 ESSER, K., DEMOSS, J. A. & BONNER, D. M.
Reverse mutations and enzyme heterogeneity.
Z. VererbLehre 1960 : **91** : 291–99.
The *td* locus of *Neurospora crassa* was studied to determine whether reverse mutation restores the exact enzyme properties of the parental strain as well as its wild phenotype. The locus controls the formation of tryptophane synthetase which has three catalytic activities and which can be converted by some tryptophane-less mutants into an immunologically related protein (CRM). From one such CRM-forming mutant, td_2, twenty-five ultraviolet-induced revertants exhibiting the wild-type growth rate were selected; these were grouped into six classes based on the catalytic activities and immunological reactions of their enzymes. It is concluded that the differences found among the revertant classes are due to qualitative rather than quantitative alterations of the enzyme. Since the number of revertant classes cannot be easily explained on the basis of back mutation at a single point, the possibility is considered that reversion may arise as the result of mutation at some other point within the

locus; this phenomenon is termed "intragenic suppression".

2887 Fejginson, N. I.
(Analysis of some negative results of experiments on vegetative hybridization).
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 1476–87. [Russian].

Unsuccessful attempts by Rzegocińska [XXVIII, 1783], Jaranowski [XXVIII, 4356], Kraevoj [XXVIII, 837] and others to produce vegetative hybrids are examined and not thought to constitute disproof of the principle of vegetative hybridization. A plea is made for more work on the practical application of the principle in plant breeding.

2888 Rudner, R. & Ryan, F. J.
Phenocopies induced by thymine in *Escherichia coli*.
Z. VerebLehre 1960 : **91** : 220–25.

Uracil-requiring (U^-) strains of *E. coli* adapted themselves to the absence of uracil by producing (1) stable uracil-independent mutants (u^+) which transmitted the character to their offspring and (2) phenotypic variants (u^-) capable of synthesizing uracil but unable to transmit the character; these variants, or phenocopies, lose their ability to synthesize uracil in the stationary phase. While thymine stimulates the appearance of phenocopies, its role does not appear to be simply that of a substrate for uracil formation since phenocopies were also produced in its absence. Further, there was a gradual growth of the U^- bacteria which was independent of mutation or phenocopy formation and suggests a residual capacity to synthesize uracil; possibly the production of enzymes is stimulated by thymine or its products.

2889 Tyson, I. H.
Studies on induced heritable changes in flax and wheat.
J. agric. Soc. Univ. Coll. Wales 1960 : **41** : p. 53. (Abst.).

"A number of flax plants resulting from environmentally induced heritable changes are maintained in the department. The growth properties of four of these were examined and also the F_1 and F_2 generations of crossings of the two extreme forms with other varieties of flax and linseed. Growth analysis shows that fundamental heritable changes have occurred akin to changes in the genotype. Diallel analysis of the crosses shows that, in the environment in which the experiment was carried out, the two extreme forms differ by additive factors. Some indication of enzymic differences was also obtained. Relatively small differences occurring in the first generation of two wheat varieties after growing their parents in different environments are due to maternal effects." [Cf. XXX, 1775].

2890 Quintanilha, A.
Michurinismo e Mendelismo. **(Mičurinism and Mendelism).**
Agros, Rio Grande do Sul 1960 : **43** : 293–307.

Statements are cited from Mičurin's published work to show that his views conformed more closely to Mendelian principles than to the Lysenko principles commonly referred so as Mičurinism. It is further pointed out, with appropriate citations, that the Malthusian principle of selection, which is fundamental to Darwin's theory, is the only part of the theory that the Mičurinists do not accept. The heterozygosity of most of Mičurin's seedlings makes it impossible to assess the effect of his use of mentors but it is considered much less than that of wide crossing. The burdos of Winkler are considered to be the result of chromosome duplication in the *Lycopersicon* scion, as suggested by Brabec [XXV, 1493]. As regards the so-called vegetative hybrids described by Russian Mičurinists, it is pointed out that no information is given in the reports concerning such points as the homozygosity of the experimental material, its rate of mutation before and after grafting, the permanency of the changes during successive generations, any cytological effects that may have been induced by the grafting, the reliability of the techniques employed and the adequacy of the controls.

2891 Krasil'nikov, N. A.
(Factors changing the properties of microorganisms).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1959 : No. 6 : 814–31. [Russian].

This review of research on microorganisms discusses mutation, directed and nondirected heritable changes, transformation and the chemical nature of heredity. While contemporary theories such as the chromosome theory and that of physiological adaptation are regarded as inadequate for explaining the mechanisms of heredity, the concepts of gene and genotype are accepted as valid. However, in the author's view, both genes and genotypes are affected by external conditions.

2892 Pateman, J. A.
Nuclear and cytoplasmic effects of ultraviolet irradiation in *Neurospora crassa*.
Z. VererbLehre 1960 : **91** : 380–90.

The viability and ultraviolet resistance of macroconidia produced by irradiated lines of *N. crassa* were, in general, lower than in the two original parent strains. This result indicates that selection for increased resistance was not effective under the conditions of the experiment [cf. XXIX, 2166]. It is suggested that heterocaryosis and cytoplasmic mixing in the multinucleate mycelium used in this study rendered ineffective any differential survival which may have occurred after irradiation. The percentage germination of ascospores derived from appropriate crosses involving irradiated and parent strains was used to measure the relative nuclear and cytoplasmic damage caused by ultraviolet radiation. The results showed that cytoplasmic damage, while not significant at low levels of radiation, is as important as nuclear damage at high radiation levels.

2893 Young, S. S. Y.
A further examination of the relative efficiency of three methods of selection for genetic gains under less-restricted conditions.
Genet. Res. 1961 : **2** : 106–21.

A mathematical study of the relative efficiencies of tandem selection, independent culling levels and index selection is presented. Relative efficiency depends upon selection intensity, number of traits selected, λ (economic weight x heritability x phenotypic standard deviation), and correlation between these traits. The general order of efficiency is index selection $\geqslant$ independent culling levels $\geqslant$ index selection. The superiority of index selection increases with the number of traits selected and is at a maximum when the traits are of equal importance. Its superiority over independent culling levels decreases with selection intensity. The superiority of independent culling levels over tandem selection increases with selection intensity and number of traits selected; it decreases with increasing differences in relative importance. Phenotypic correlation between traits reduces the superiority of index selection.

2894 Griffing, B.
Accommodation of linkage in mass selection theory.
Aust. J. biol. Sci. 1960 : **13** : 501–26.

In continuation of the treatment presented in an earlier paper [1232], the author develops a general theory of mass selection allowing for n alleles/locus, arbitrary linkage, different recombination values in the two sexes, and arbitrary dominance and epistasis. On the basis of this theory a method is proposed for detecting the influence of natural selection in modifying response to artificial selection even when epistasis is producing effects which mimic those of natural selection.

EVOLUTION

2895 Nuždin, N. I.
(Lamarck, Darwin and modern biology).
Agrobiologija (Agrobiology) 1959 : No. 6 : 803–31. [Russian].

[Cf. XXX, 2245].

2896 Kajja, S.
(Progress of the evolution theory in Japan).
Agrobiologija (Agrobiology) 1959 : No. 6 : 844–45. [Russian].

The history of evolutionary ideas in Japan is briefly outlined.

2897 Kimura, M.
(Genetic load and its significance in evolution).
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 7–33. [Japanese].

Five types of genetic load are distinguished: (1) that resulting from harmful mutation (L_m); (2) segregational load, arising from overdominance or meiotic drive (L_e); (3) dysmetric load, arising from division of labour between genotypes; (4) load resulting from intragroup and intergroup selection; and (5) load resulting from substitution of one allele by another through natural selection.

It is postulated that, in the course of evolution, genetic parameters become adjusted so that the sum of the mutational and segregational loads is minimized. Then, if E, the rate of substitution of genes in horotelic evolution is taken as 1/300, and D, the total mutational damage is taken as 2, $L_m = 0{\cdot}098$ and $L_e = 0{\cdot}199$.

Since the rate of accumulation of genetic information (H) by natural selection is given by $H = L_e/\log_e 2$, the value of H is *ca.* 0·29. The total genetic information accumulated since the Cambrian era is then of the order of 10^8 bits, which should correspond to the improvement in organization of higher plants and animals since the Cambrian. This value corresponds to the value of 10^7–10^9 bits calculated by Elsasser for the information content of man.

2898 Kimura, M.
Natural selection as the process of accumulating genetic information in adaptive evolution.
Genet. Res. 1961 : **2** : 127–40.
An expanded account in English is given of the last section of a previously published Japanese lecture [cf. 2897].

2899 Dvorjankin, F. A.
(Darwinism and socialist agriculture).
Zemledelie (Agriculture) 1959 : No. 10 : 19–24. [Russian].
Evolutionary theory is discussed in relation to Mičurinism, with which it is said to have more in common than with preformationism, neomendelism, Weismannism and Morganism. In particular Darwin is commended for recognizing the role of environment and the inheritance of acquired characters.

2900 Dvorjankin, F.
(Darwinism and agricultural science).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 10 : 5–9. [Russian].
[Cf. 64].

2901 Fejginson, N. I.
(C. Darwin and modern ideas. On the occasion of the centenary of publication of "The Origin of Species").
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 10 : 3–8. [Russian].
Mičurinism as the modern development of Darwinian evolutionary theory is discussed. Neodarwinism and the mutational theory are rejected.

2902 Ozol, A.
(The theory of C. Darwin and progress in biology).
Latv. PSR Zināt. Akad. Vestis 1959 : No. 12 : 107–15. [Russian].
Darwinism is discussed from the Mičurinist viewpoint, early supporters of the theory of evolution in England, France, Germany, Russia and the USA being mentioned.

2903 Mason, H. L. & Langenheim, J. H.
Natural selection as an ecological concept.
Ecology 1961 : **42** : 158–65.
It is pointed out that "natural selection, being a relation between an organism and its environmental conditions, is an ecological concept. Many ecologists, however, may not have seen the direct role of this concept in their problems because Darwin presented the theory in a context of evolutionary explanation of the origin of species. Subsequent usage has further engulfed the concept with explanations of evolution and cytogenetic operations such that the ecological operations have been obscured. This confusion is primarily a product of language and the organization of knowledge." The author therefore gives a semantic analysis of Darwin's concept of natural selection and of the concepts of natural selection as used by population geneticists. With a view to facilitating the interpretation of ecological problems, he then attempts, by further semantic discussion, to establish the "truth conditions upon which a rigorous concept of natural selection may rest", and to show how information derived from classification of data on many selective factors may be organized so as to indicate the role of natural selection in the various disciplines in biology.

2904 Sobol', S. L.
(The literary heritage of Charles Darwin).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1959 : No. 6 : 921–28. [Russian].
This survey of published work by Darwin comments on past and present appreciation of Darwinism in Russia.

CYTOLOGY

2905 Akhauri Balram Prasad & Umakant Sinha.
Codeine phosphate as a pretreating agent.
Curr. Sci. 1961 : **30** : p. 30.
As a result of pretreatment of root tips of *Pisum sativum* with codeine phosphate, the following effects were observed: disorganization of the spindle; separation and contraction of the chromosomes; and clarification of primary constrictions.

2906 Bhattacharjee, S. B.
Action of X-irradiation on *E. coli*.
Radiation Res. 1961 : **14** : 50–55.
"The radiation sensitivity of *E. coli* in the wet condition was compared with that in the dry condition. It was found that the radioresistance of the cells reached a saturation value after vacuum desiccation for about 24 hours. The values of 37% survival doses obtained were 3·6 and 12·4 kr for wet and 24 hr dried samples, respectively. By a comparison of the wet and dry irradiation data, the mean diffusion distance

of the radicals formed during irradiation in the wet condition was estimated. The variation in the diffusion distance as a function of the number of radicals formed per primary ionization (Y) and the number of targets per cell (n) has been found out. This diffusion distance was found to be 20 A for $Y = 4$ and $n = 20$."
[Author's summary].

2907 Ryter, A.
Étude au microscope électronique des transformations nucléaires de *E. coli* K12S et K12S (λ26) après irradiation aux rayons ultraviolets et aux rayons X. [**An electron microscopy study of nuclear transformations in *E. coli* K12S and K12S (λ26) after ultraviolet and X irradiation**].
J. biophys. biochem. Cyt. 1960 : **8** : 399–412.

"Nuclear transformations induced in *E. coli* K12S and K12S (λ26) by ultraviolet radiations and x-rays have been studied with ultrathin sections in the electron microscope. The nucleoplasm keeps its normal aspect during 'fragmentation' and during 'condensation' of the nucleus into the 'vesicular' form. Serial sections show that the 'fragmented' nucleus consists in reality of only one very tortuous vacuole. No difference either in the shape or in the fine structure of the nucleus could be observed between the lysogenic strain and the non-lysogenic strain. A high concentration of NaCl has a 'condensation' effect on the fragmented nuclei and decreases the induction rate."
[Author's summary].

2908 Accola, P.
Isolierung von Zellkernen aus Zwiebelwurzeln. (**The isolation of cell nuclei from onion roots**).
Ber. Schweiz. bot. Ges. 1960 : **70** : 352–94.

The procedure described involves homogenizing cells in a concentrated solution of crude sugar, filtering through muslin and a very fine steel sieve and centrifuging; there is a further fractionation using the ultracentrifuge. The sediment is treated with coriphosphine O and the nuclei may then be distinguished from cell walls and cytoplasmic particles, when viewed in ultraviolet light. Quantitative and chemical analyses of the sediment are considered.

2909 Leslie, I.
Biochemistry of heredity: a general hypothesis.
Nature, Lond. 1961 : **189** : 260–68.

From a comparison of the base composition of DNA and various RNA fractions and from autoradiographic studies of RNA movement in a number of organisms, the following hypotheses are suggested. The transfer of information from DNA to RNA occurs in two ways. In higher plants and animals, single-strand RNA is formed by the activity of duplex DNA. In microorganisms, single-strand RNA is formed from single-strand DNA. It is further suggested that the histones of the cell have the function of stabilizing RNA templates while acting as depolymerases towards the complementary strands.
It was also found that when duplex base ratios were calculated corresponding to the single-strand nucleic acids (DNA or RNA) of various viruses, these were the inverse of those for the duplex values of the corresponding nucleic acids of the host cell.

2910 Cavalieri, L. F., Finston, R. & Rosenberg, B. H.
Multi-stranded deoxyribonucleic acid as determined by X-irradiation.
Nature, Lond. 1961 : **189** : 833–34.

A study of the relation between the decay in molecular weight of DNA samples from diverse sources brought about by X irradiation and X ray dose has shown that, in *Pneumococcus*, DNA is four stranded.

2911 Krause, M. C.
An evaluation of the use of tritiated thymidine in chromosome studies.
Diss. Abstr. 1960 : **21** : LC Card Mic. 60–3221 : p. 438. (Abst.).

A summary is given of the results of four studies, in which use was made of root tips of *Allium cepa* and *Vicia faba*: (1) comparison of the incorporation of H^3 and C^{14}-thymidine in the presence and absence of chloramphenicol, (2) the action of H^3-thymidine upon incorporation of C^{14}-thymidine in DNA, (3) comparison of the effect of three different specific activities of H^3-thymidine upon chromosome replication and (4) some effects of colchicine on incorporation of H^3-thymidine. Evidence was obtained that incorporation of tritiated thymidine interferes with the normal process of DNA synthesis in chromosomes.

2912 Nakada, D. & Ryan, F. J.
Replication of deoxyribonucleic acid in non-dividing bacteria.
Nature, Lond. 1961 : **189** : 398–99.

Using the method of density-gradient centrifugation, evidence was obtained that DNA

formation in nondividing cells of *Escherichia coli*, without concomitant synthesis of protein, involved replication, as in dividing cells.

2913 Patau, K. & Das, N. K.
The relation of DNA synthesis and mitosis in tobacco pith tissue cultured in vitro.
Chromosoma 1961 : **11** : 553–72.

DNA synthesis and mitosis were initiated in cultured tobacco pith tissue cells by means of indole-3-acetic acid and kinetin [cf. XXVII, 1146]. Tritiated thymidine was used to establish DNA synthesis and the degree of ploidy was ascertained by measuring DNA content; DNA classes 2C, 4C and 8C correspond to diploid, tetraploid and octoploid, respectively. All mitoses in the "new" cells, i.e. those resulting from division in culture, were diploid and were preceded by DNA synthesis during culture. Many of the "old" cells, which had not previously divided in culture, underwent diploid or polyploid mitoses, but while some had synthesized DNA during culture others had not; these nonradioactive mitoses still occurred after 16 days. It is therefore suggested that, in differentiated tissues, a 4C nucleus should be regarded as being potentially both diploid and tetraploid; under conditions conducive to DNA synthesis and mitosis it seems impossible to predict whether the nucleus will enter a diploid mitosis or, after undergoing DNA synthesis, a tetraploid one.
A high DNA content strongly inhibited DNA doubling, the incidence of doubling being much smaller in 8C nuclei than in 4C nuclei; it appears to have little effect on mitosis however. Somatic polyploidization is thought to be the result of two DNA doublings between which mitosis was omitted.

2914 Satô, D.
The karyotype analysis in Zingiberales with special reference to the protokaryotype and stable karyotype.
Sci. Pap. Coll. gen. Educ. Univ. Tokyo (Biol. part) 1960 : **10** : 225–43.

Chromosome numbers are given for a large number of species belonging to genera of the Musaceae, Strelitziaceae, Zingiberaceae, Cannaceae and Marantaceae, and caryotypic formulae are given for 24 species belonging to 13 genera. The most primitive caryotype, the protocaryotype, is considered to be represented by *Calathaea veitchiana* (Marantaceae) with $n = 4$. Other basic or stable caryotypes are considered to have been derived from it by fragmentation, translocation, polyploidization and chromosome shortening.
The distribution of basic chromosome numbers within the Zingiberales shows the predominance of 9, 11 and, to a lesser extent, 12-chromosome caryotypes. With reference to similar studies on caryotype evolution in lower plants [cf. XXX, 2258] an analogy is drawn between the number of chromosomes in the stable caryotypes and the number of microfibrils present in the flagella and centriole in the spermatozoids of such plants. "Eleven microfibrils of flagellum ($11 = 2 + 9$) and nine microfibrils (cylinders) of centriole ($9 = 0 + 9$) seem to be indirectly or directly connected with the spindle fibres of kinetochores of chromosomes." In conclusion it is stated that "the predominance of 9 and 11 in basic numbers of chromosomes [in the Zingiberales] may be explained by the intimate relationship of flagellum-blepharoplast-centrosome(centriole)-kinetochore".

2915 Sasaki, M.
Observations on the modification in size and shape of chromosomes due to technical procedure.
Chromosoma 1961 : **11** : 514–22.

From studies on mammalian somatic tissues which were treated with a 50×10^{-8}M colchicine solution for periods varying from 1 to 5 hr. at 37° C., it is concluded that (1) a highly contracted chromosome tends to have its centromere more medianly situated than does the same chromosome in a less contracted state; (2) long chromosomes contract more strongly than short ones colchicine-treated for the same length of time; and (3) the process of chromatid condensation is not synchronized in all members of the chromosome complement at any stage in the mitotic cycle.

2916 Singh, D. N.
Use of induced rooting in cytological studies.
Nature, Lond. 1961 : **189** : 420–21.

As suggested by experiments with stem cuttings and isolated leaves of *Rauwolfia serpentina* and *Aralia filicifolia*, induction of adventitious roots by a growth-promoting substance such as α-naphthalene acetic acid may overcome the problem of lack of seedlings for the study of somatic chromosomes, when seeds are not easily available. The treatment with growth-promoting substances did not appear to affect chromosome number and morphology.

2917 Kusanagi, A. & Tanaka, N.
Cytological studies on *Luzula* chromosome. II. Pachytene chromosome of *Luzula purpurea*.
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 67–70.
Further evidence is presented in support of the authors' finding that *L. purpurea* chromosomes are dicentric [cf. XXX, 2261].

2918 Sarvella, P.
Circular structures associated with pachytene chromosomes.
Canad. J. Genet. Cyt. 1961 : **3** : 89–90.
During an examination of pachytene in *Gossypium herbaceum* by phase microscopy, circular bodies, tentatively termed spherosomes, were seen in terminal and interstitial positions on the chromosomes. The spherosomes did not stain as darkly with acetocarmine as the nucleolus. Smaller, darker-staining components could however often be distinguished at the periphery or in the centre of the interstitial spherosomes. Like the nucleolus, the spherosomes apparently began to disappear at diplotene and were rarely seen at later stages. Spherosomes were also found in all the 15 additional dicotyledonous and monocotyledonous species examined. The possible function of the spherosomes is briefly discussed.

2919 Yamasaki, N.
Differentielle Färbbarkeit der somatischen und meiotischen Metaphase-chromosomen von *Cypripedium debile* nach DNase-Behandlung. (**The differential stainability of the somatic and meiotic metaphase chromosomes of *C. debile* after DNase treatment**).
Chromosoma 1961 : **11** : 479–83.
After fixation with a 1 : 3 mixture of glacial acetic acid and alcohol and treatment with DNase followed by the Feulgen reaction, the chromosomes showed the same differential staining as in earlier experiments [cf. XXX, 82].

2920 Datta, M.
The effect of visible light on the mitotic spindle.
Exp. Cell. Res. 1960 : **21** : 261–73.
Endosperm tissue from the fruit of *Cocos nucifera* and *Areca catechu* was used in a study on the effects of light on the mitotic spindle. The results indicated that "the nuclear membrane is permanent, carrying within it, at all stages of division and reduction, the total content of nuclear matter. The bipolar highly orientated state of the achromatic figure is changeable by visible light, the whole mitotic figure assuming a spherical shape at a certain intensity and duration of the illumination. The visible light has probably the effect of dissociating the linked chains of extended protein micelles which compose the bulk of spindle substructure, resulting in their return to the amorphous gel.
"The bonding of chromosomes at their kinetochores with the spindle fibres has the effect of altering spindle structure both in the areas occupied by them and that over which they have passed. As a result, at metaphase and anaphase the chromosome plates and that area of the spindle bounded by them remain inert to the action of light. The metaphase spindle remaining unaltered at the equator, the dissociating plasm is released at the polar ends. The spindle retains its bipolar orientation while it is undergoing reduction and can remain functional as long as it has the elongated shape.
"This pattern of breakdown under illumination compares favourably in points of similarity with the observed pattern of breakdown under colchicine and coumarin treatment, and may well reflect the sequence of events which take place in all cases of arrested mitosis in which, usually, the fact of spindle destruction has had to be deduced."

2921 Angulo Carpio, M. D.
Acción de agentes químicos en citogenética. (Notas bibliográficas). IV. [**Action of chemical agents in cytogenetics. (Bibliographical notes). IV**].
Genet. iber. 1960 : **12** : 205–21.
The main sections in this bibliography deal with colchicine, alkaloids other than colchicine, non-alkaloid compounds, specifically mutagenic substances and other active substances [cf. XXX, 1088].

2922 Čel'cova, L. P.
(The types of division of nuclei).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **135** : 971–76. [Russian].
Three modes of division were observed in the leaves of wheat and onion and the root tips of *Taraxacum* at the Institute of Genetics of the USSR Academy of Sciences: (1) mitosis; (2) a mode of division intermediate between mitosis

and amitosis; and (3) amitosis. Each type of division is associated with certain physiological states of the nucleus. For instance, in wheat, mitoses were observed at the growing point, in primordial leaves and in undifferentiated cells of growing leaves. As the leaves grew and the cells comprising them became more differentiated, mitoses were superseded by amitoses. The intermediate type of division was mostly observed in leaf primordia at the transitional phase from mitosis to amitosis.

2923 Richards, B. M. & Bajer, A.
Mitosis in endosperm. Changes in nuclear and chromosome mass during mitosis.
Exp. Cell Res. 1961 : **22** : 503–08.

"The dry mass of the nuclei and chromosomes of cells from the endosperm of *Leucojum aestivum* has been measured with the C.T.S. Dyson Interference microscope. The nuclear mass was found to drop during prophase before the nuclear membrane disappears, and at metaphase the chromosomes weigh only approximately 25 per cent of the mass of early prophase nuclei. It is suggested that non-chromosomal protein is lost to the cytoplasm and contributes to the formation of the perinuclear 'clear-zone' typically observed in cells from endosperm at prophase. During telophase the reconstructing nucleus was found to increase in mass by an amount equal to the mass of the chromosome set in early telophase. These results imply that the interphase increase in mass is threefold not twofold as found in other cell types."
[Authors' summary].

2924 Liverman, J. L.
Control of growth and reproductive processes by red and far-red light.
Radiation Res. 1960 : **13** : suppl. 2 : 133–56.

This review includes a discussion of the role of red and far-red light in X-ray-induced chromosome breakage.

2925 Ono, R.
(The cytological effects of extracts from poisonous plants. I. The action of the extract from *Cicuta virosa* on meiosis in *Allium victorialis* subsp. *platyphyllum*).
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 120–24. [Japanese].

This extract caused some chromosome stickiness, formation of bridges and fragments, and lagging.

2926 Ono, R. & Tanihuzi, S.
(The cytological effects of extracts from poisonous plants. II. Mitotic aberrations caused by extracts from *Arisaema japonicum* and *Chelidonium majus*).
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 125–32. [Japanese].

The extracts were applied to root tips of *Trillium kamtschaticum* and ovules of *Paris tetraphylla*. The first extract induced chromosome stickiness, bridge formation, pseudochiasmata and chromosome elongation; the second induced stickiness.

2927 Ohno [Ono], R. & Tanihuzi, R.
(The cytological effects of extracts from poisonous plants. III. Aberrations in the division of pollen mother cells caused by extracts from *Arisaema japonica*).
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 167–76. [Japanese].

The following effects were observed in PMCs of *Trillium kamtschaticum*: chromosome clumping and contraction, lagging, and failure of the chromosomes to converge to the poles at telophase I.

2928 Rieger, R. & Michaelis, A.
Chromatidenaberrationen nach Einwirkung von Äthylmethansulfonat (Methansulfonsäureäthylester) auf Primärwurzeln von *Vicia faba* L. **(Chromatid aberrations after the action of ethyl methane sulphonate on primary roots of *V. faba* L.).**
Kulturpflanze, Berlin 1960 : **8** : 300–43.

The effect of different concentrations of ethyl methane sulphonate on the aberration rate was studied; fairly high concentrations induced only chromatid aberrations. Myleran was found to be 50 times more active than ethyl methane sulphonate. Most of the aberrations occurred in the heterochromatin in the m chromosomes. Raising the temperature from 12° to 30° C. increased the activity of both these substances and they had no effect below 12° C. Hydrolysis also reduced the radiomimetic effect. Combined treatment with ethyl methane sulphonate and ethyl alcohol or myleran increased the aberration rate, the effect being more than additive. All three

chemicals are thought to have their effect in the first half of interphase.

2929 Rieger, R. & Michaelis, A.
Beziehungen zwischen dem Wurzelwachstum und der Sensibilität der Wurzelmeristeme gegenüber verschiedenen Radiomimetica bei *Vicia faba*. (The relations between root growth and the sensitivity of the root meristem to different radiomimetic substances in *V. faba*).
Chromosoma 1961 : **11** : 573–81.

After treatment with ethanol, the sensitivity as measured by the percentage of metaphases with chromosome aberrations was similar in roots of 2 and 4 cm. length; the number of aberrations was much less in roots of 10 cm. length. When myleran and nitrogen mustard were used the decrease in sensitivity was later and less marked. There was no difference in sensitivity between 2 cm. main and lateral roots with myleran and nitrogen mustard treatments but hardly any aberrations occurred in lateral roots after ethanol treatment, although the percentage of damaged cells was 44% in the main root meristem. It is thought that these variations in sensitivity are real and due to metabolic changes.

2930 Merz, T.
Effect of mitomycin C on lateral root-tip chromosomes of *Vicia faba*.
Science 1961 : **133** : 329–30.

Treatment with a 0·001% concentration of mitomycin C for 1 hr. proved to be the most efficient for examining the effects of this substance upon chromosomes. After this treatment, a pronounced inhibition of mitosis occurred. Chromatid aberrations were observed from 24 up to 96 hours after treatment. The ability of mitomycin C to induce breaks was not appreciably modified by changes in pH, temperature and oxygen tension and by lack of adenosine triphosphate. Breaks were induced mainly in the long chromosomes. About 80% of the breaks detected in the long chromosomes were situated in the nucleolar-organizer constriction, and about 15% in the heterochromatic segments on either side of the centromere. Most of the remaining breaks occurred in heterochromatic segments of the short chromosomes. In all, about 93% of the breaks were situated in heterochromatin. The effects of mitomycin C upon chromosomes are compared with those of other radiomimetic compounds.

2931 McQuade, H. A. & Friedkin, M.
Radiation effects of thymidine-^{3}H and thymidine-^{14}C.
Exp. Cell Res. 1960 : **21** : 118–25.

A comparative study of the frequency of chromosome aberrations induced in the rootlets of onion seedlings by labelled thymidine is reported [cf. XXVII, 1152]. Thymidine in which C^{14} was present in the methyl group produced twice as many aberrations as thymidine with C^{14} in the pyrimidine ring. Thymidine-H^3 and thymidine-2-C^{14}, at the same concentration and specific activity, induced approximately equal numbers of chromosome aberrations. Uptake studies on treated rootlets showed that two-thirds of the thymidine remained in the cell cytoplasm while the remainder was incorporated in the chromatin.

Data are provided on the percentage of aberrant cells induced by six different concentrations of thymidine-H^3. When a concentration of 0·0225 μg. per ml. (specific activity, 890 μc. per μm.) was used, 99·45% of the treated cells showed chromosome aberrations.

Rootlets treated for 18 hr. in 0·8 ml. of thymidine-H^3 at 0·42 μg. per ml., 3 μc. per μm., were grown under isotope-free conditions for 24, 48 and 72 hr. The frequencies of chromosome aberration decreased as posttreatment periods were extended. The decrease is attributed to the dilution of incorporated thymidine-H^3 resulting from the division of chromatin during mitosis.

2932 Natarajan, A. T.
Chromosome breakage and mitotic inhibition induced by tritiated thymidine in root meristems of *Vicia faba*.
Exp. Cell. Res. 1961 : **22** : 275–81.

The frequency of chromosome aberrations and the extent of mitotic inhibition were found to depend on the specific activity of labelled thymidine. There was a marked inhibition of cell division in root meristem tissues tested 24 and 34 hr. after treatment with thymidine-H^3 of specific activity higher than 90 μc./μmole. At lower specific activities, cell division proceeded normally.

As regards chromosome aberrations, the frequency of anaphase bridges and acentric fragments increased with specific activity. Treatment with thymidine-H^3 at 45 μc./μmole resulted in an aberration frequency similar to that observed in untreated control cells. At higher specific activities, the frequency of aberrations was higher but fell as the time after

treatment increased. "It is concluded that when used at low tritium levels with a long autoradiographic exposure duration, tritiated thymidine can be used as an efficient label for chromosomes without significant interference with cellular processes."

2933 Angulo Carpio, M. D.
Acción de agentes físicos en citogenética. (Notas bibliográficas). VII. [**Action of physical agents in cytogenetics. (Bibliographical notes). VII**].
Genet. iber. 1960 : **12** : 223–40.

This further list of references [cf. XXX, 3438] is divided into sections dealing with: X rays; X rays combined with other radiations; other types of radiation; temperature; and physical agents in association with chemical agents.

2934 Wolff, S.
Problems of energy transfer in radiation-induced chromosome damage.
Radiation Res. 1960 : **13** : suppl. 2 : 122–32.

Studies on biophysical aspects of chromosome breakage are reviewed. In one section, various models of chromosome structure are critically discussed.

2935 Wada, B.
Effects of radiations on mitoses studied by *Tradescantia* test *in vivo* I. X-ray irradiations by small doses.
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 205–11.

Staminal hair cells of plants receiving X-ray doses of 2, 4 and 8 r. were examined for chromosome bridges occurring during a 10 hr. period on the day after treatment. Cells containing one or more bridges comprised 48, 62 and 90%, respectively, of all dividing cells examined and the ratio of bridges to total number of chromosomes was 4·03, 4·8 and 11·4% respectively.

2936 Câmara, A., Castro, D. & Noronha-Wagner, M.
Cytogenetics of accessory chromosomes in *Luzula campestris* DC.
Agron. lusit. 1959 : **21** : 193–99.

A plant of *L. campestris*, a species without a localized centromere and normally having $2n = 12$, contained a heterochromatic accessory without any phenotypical effect. As indicated by the chromosome numbers of its derivatives, there appeared to be some process facilitating the maintenance and quantitative increase of the B chromosome. The accessory never paired with any of the other 12 chromosomes, which regularly formed 12_{II}. It divided at meiosis I in the PMCs, being incorporated at random in a telophase II nucleus. On the basis of the cytological observations on the PMCs and evidence from hybrids resulting from crosses between normal plants and ones containing one accessory, it could be concluded that non-disjunction of B chromosomes did not occur during microsporogenesis or megasporogenesis. The maintenance and quantitative increase of the B chromosome may possibly be the result of a combination of preferential fertilization and preferential segregation, with a preponderance of the latter.
Observations are also recorded on the pairing behaviour of B chromosomes during meiosis in plants with two accessories.

2937 Ščerbakov, V. K.
(Polyploidy in breeding ornamental plants).
Bjull. mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1960 : **65** : No. 4 : 102–11. [Russian].

The extensive occurrence of natural polyploids among the main ornamental species is exemplified by reference to the literature, many cases of amphidiploid interspecific hybrids being mentioned. Many artificially produced polyploids are also cited and it is stated that after selection the rate of seed production in the polyploids may come to equal and even exceed that of the diploids. Suitable techniques for inducing polyploidy in a number of representative species by colchicine treatment are described. For *Asparagus officinalis*, treatment of shoots 0·3–0·9 cm. in length has proved most successful.

2938 Turian, G.
Mitose végétative et action polyploïdisante de l'acide borique chez *Allomyces macrogynus*. (**Vegetative mitosis and polyploidizing action of boric acid in *A. macrogynus***).
Rev. Cytol. Biol. végét. 1959 : **21** : 63–69.

As a result of studies on the effect of a 0·05 M boric acid solution, it is suggested that "the polyploidizing effect of boric acid in *Allomyces* may depend on the ability of this chemical to complex ribonucleic acid of the spindle-like mechanically functioning nucleolus during vegetative mitosis. In the enlarging boric-inhibited nuclei, chromatin must increase by some kind of uninterrupted processes of endomitosis."

2939 Pignatti, S.
Il significato delle specie poliploidi nelle associazioni vegetali. (**The significance of polyploid species in plant associations**).
Atti Ist. veneto 1959–60 : **108**; also Lav. Bot., Padova 1960 : **22** : 75–98.

Studies of a number of different associations showed that each had a characteristic proportion of polyploid species, which did not vary materially according to temperature. However, zones with low temperatures often had a larger proportion of those associations characterized by a high proportion of polyploids, which produces an appearance of correlation between low temperature and polyploidy. The only exceptions were the associations based on conifers, and those in high mountain valleys, where the proportion of diploids was higher than would otherwise be expected. The higher proportion of polyploids in the postglacial zones of the northern hemisphere is ascribed to the fact that they were colonized at a time when the proportion of polyploids in the flora had already increased.

2940 Linskens, H. F., Schrauwen, J. A. M. & van den Donk, M.
Überwindung der Selbstinkompatibilität durch Röntgenbestrahlung des Griffels. (**Overcoming self incompatibility by X irradiation of the style**).
Naturwissenschaften 1960 : **47** : p. 547.

The self incompatibility reaction of *Petunia* may be broken down by X irradiation of the pollen, leading to mutation of the *S* allele, or by irradiation of the style immediately prior to selfing. For the latter treatment, a dose of 2000 r. was most effective, nearly half the irradiated flowers yielding seed. The incompatibility reaction was unaffected by irradiation of the style 20 hr. after self pollination, but selfing 24 hr. after irradiation led to an increase in pollen-tube growth, although this was not sufficient to allow fertilization to take place. The stylar effect is regarded as biochemical rather than mutational.

2941 Dufau, O.
Structure cytologique du pollen de quelques angiospermes. (**Cytological structure of the pollen in some angiosperms**).
Rev. gén. Bot. 1961 : **68** : 73–110.

Studies were made on mature pollen grains from 43 species representing 30 families. Monocotyledons, as represented by the Liliiflorae, had binucleate pollen grains. Among the dicotyledons the Dialypetalae were generally binucleate while the Gamopetalae were generally trinucleate; the Umbelliferae provided a conspicuous exception in the former group. The Apetalae were usually binucleate but the Centrospermae were trinucleate. The similarity between pollen grains of *Trollius europaeus* (Ranales) and those of the Liliiflorae is mentioned in a note on the possible value of pollen cytological characters in evolutionary studies.

TAXONOMY

2942 Runemark, H.
The species and subspecies concepts in sexual flowering plants.
Bot. Notiser 1961 : **114** : 22–32.

An evolutionary approach in formulating taxonomic criteria is advocated. The author suggests that two populations should be referred to different species if (1) "there is no potential ability of gene-exchange between them," and (2) "they are separated by an absolute, hereditary discontinuity in one or several basic morphologic characters or a combination of such characters." As used by the author, the term morphology is extended so as to include anatomical, cytological and chemical characters. "Basic" characters are those which can be easily determined, as opposed to "nonbasic" features which require complicated analysis or experiments for their determination. It is further proposed that two populations should be referred to different subspecies if (1) "the gene-exchange between them is restricted on genetic grounds or is limited or made impossible by external means" and (2) "they are separated by a more or less strong, hereditary discontinuity in one or several basic morphologic characters or a combination of such characters." According to this concept, "morphologically well distinguished ecotypes, geographic and biologic races as well as morphologically distinct types which are more or less genetically isolated are regarded as subspecies." A few examples are given to illustrate the application of these concepts of species and subspecies.

2943 Vasil'čenko, I. T.
(**Experimental systematics and the main directions of its development**).
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 1585–99. [Russian].

The view is expressed that experimental studies should be regarded as complementary to purely descriptive studies in taxonomy; it enables the taxonomist to distinguish modifications due to

habitat from hereditary differences of systematic value, and to establish the range of polymorphism within species and genera; by combining the experimental approach with thorough study in nature the existence of ecotypes in many species has been recognized. The role of hybridization in the origin of species in nature is exemplified by *Papaver argemone*, which seems to be a hybrid of *Roemeria* sp. x *Papaver* sp. Many of the forms of *Tulipa* found wild in Central Asia are clearly the result of interspecific hybridization, and no clear lines of demarcation can be found between species such as *T. fosteriana*, *T. carinata* and *T. ingens*. Other examples cited are intergeneric hybrids such as *Hordeum turkestanicum* x *Clinelymus* (*Elymus*) *nutans* and other combinations within the Gramineae [cf. XXX, 3630]; *Sorbus sibirica* x *Cotoneaster melanocarpa*; and *Prunus sogdiana* x *Aflatunia* (*Prunus*) *ulmifolia*. It is pointed out that hybridization between taxa which will not cross today may have occurred more readily in conditions obtaining in earlier geological periods.

Juvenile growth forms may throw light on the phylogenetic relationships of some plants; thus Z. N. Filimonova, having studied some 70 species of *Allium*, has shown that each section, or group of sections, is characteristic in the morphology of the seedlings; exceptions are found in *A. oreophilum* and *A. kujukense*, the systematic position of which should therefore be reconsidered.

The importance of neoteny in the origin of some of the higher orders has been emphasized by Tahtadžjan; that it can also play a part in the origin of species and lower taxa is illustrated by *Astragalus albertii* and by *Fraxinus excelsior* var. *monophylla*. Many more cases could, it is thought, be found if they were looked for.

Herbarium collections as they are at present give very little idea of the geographical variation of systematic characters and need to be supplemented both by field observations and appropriate experiments. In this connexion S. S. Hohlov [cf. XVIII, 697] has pointed to the increased variation that often occurs at the periphery of the area, and N. J. Rubcov to the merging of many specific characters in areas of contact between two or more species, as with *Carex stenophylloides* and *C. pachystylis* in the submontane deserts of the Tien-shan. Importance is attached also to intensive studies of variation within a small restricted population, as done by I. V. Cinger for *Camelina* and *Spergula*, and to studies of developmental and seasonal differences, as in the work of Kerner and Wettstein, and later by E. I. Proskorjakova, who succeeded in shedding light on genetic interrelationships of many species and genera of the flora of Central Asia by a study of seed germination and its relation to temperature and other ecological factors. Growth anomalies are also thought to be capable of throwing light on phylogenetic relationships, in the way used by A. A. Fedorov in the Fagales. The value of cytogenetic investigations of the kind made by Stebbins and by Clausen, Keck and Hiesey in the USA and by Z. P. Bočanceva in the USSR is also mentioned.

CROP PLANTS

Thirty-first Annual Report of the University of Birmingham Research Committee 1959–1960 : Pp. 137.

2944 *Department of genetics.* (*pp. 34–36*).
Studies on the degree of disturbance of the nuclear and morphological phenotypes in the progeny of crosses between perennial and Italian ryegrass indicated that these forms share a similar gene pool. On this evidence, their division into two distinct species does not appear to be justified.

The value of anomalous genetic situations has been emphasized in studies on *Aspergillus*. "Here the change in frequency of induced mutant cytoplasmic particles during development and differentiation of the reproductive structures suggest that these particles are in fact eliminated by the process of development in sexual organs. Investigations into the system of variation in wild fungi have similarly shown that the cytoplasm is involved, at least in part, in the system of variation known as the 'dual phenomenon' and is probably also implicated in the adaptations of the blight fungus *Phytophthora infestans* to rapid spread in tubers of particular varieties of potato in the field."

2945 *Department of microbiology.* (*pp. 37–38*).
Studies on interallelic complementation in heterocaryons of *Neurospora crassa* have continued. Further cases of complementation, involving stages in the joint synthesis of isoleucine and valine, have been identified. There is evidence to indicate the existence of a two-dimensional complementation map for the genes *histidine–1* and *lysine* (*asco*). The sites of mutation are currently being mapped.

"Although it is established that the formation of specific cellular proteins is dependent on the genetic composition of the cell it is improbable

that the genes act directly in protein synthesis. Ribonucleic acid is thought to apply the information carried by the gene to the task of assembling proteins and it is proposed to study the behaviour of specific RNA molecules which are responsible for the formation of specific proteins. Fractionation procedures have been developed for this purpose and will be applied to a study of RNA synthesis during adaptive enzyme formation and virus multiplication in bacteria."

2946 Howard, H. W.
Crops and plant breeding.
J. R. agric. Soc. 1960 : **121** : 154–69.
A review is given of the aims and recent achievements of breeding wheat, oats, barley, grasses, clovers, lucerne, potatoes, sugar beet, kales, rape and *Vicia faba* at the Cambridge Plant Breeding Institute, the Welsh Plant Breeding Station and the Scottish Plant Breeding Station. Pathological investigations at these three stations relevant to the development of resistant varieties and to other methods of disease control are also surveyed.

2947 Das Institut für Kulturpflanzenforschung Gatersleben im Jahre 1959. (**The Institute for Research in Crop Plants in the year 1959**).
Kulturpflanze, Berlin 1960 : **8** : 5–32.
Genetical studies of *Antirrhinum, Bryophyllum,* barley, soya bean, tomato, apple, *Cucurbita, Vicia* and bacteria were continued. Systematic studies and selection of forest trees were also carried out.

2948 Engel, K.-H. & Raeuber, A.
Untersuchungen über die Beziehungen zwischen Phänometrie und Pflanzenzüchtung. (**Investigations on the relations between phenometry and plant breeding**).
SB dtsch. Akad. LandwWiss. Berl. 1960 : **9** : No. 2 : Pp. 22.
The separate and combined influences of wind force, soil moisture and temperature upon growth of leaves and ear were studied in maize, and it was found that 70–80% of the variation in growth could be attributed to these three factors with a significance of 99·9%. Optimum values for the three factors were found [cf. 415]. Similar studies in potato have revealed optima which vary according to the organ under study but are similar for different varieties. Varietal differences in response to deviations from the optima were however found. The application of such studies to breeding is discussed.

Tätigkeitsbericht der Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. für die Zeit vom 1.4.1958 bis 31.3.1960. (**Report on the activity of the Max Planck Society for the Promotion of Science for the period from 1 April 1958 to 31 March 1960**).
Naturwissenschaften 1960 : **47** : 553–99.

2949 *Max-Planck-Institut für Biologie.* (*Max Planck Institute of Biology*). (*pp. 559–62*).
Work on the production of tobacco mosaic virus mutants *in vitro* by nitrous acid is briefly reported [cf. XXIX, 1206]. A new mutant designated *wettsteinii* has been obtained by X irradiation of vegetative haploid plants of *Antirrhinum majus.*

2950 *Max-Planck-Institut für vergleichende Erbbiologie und Erbpathologie.* (*Max Planck Institute of Comparative Genetical Biology and Genetical Pathology*). (*pp. 567–69*).
Mechanisms underlying radiation inactivation at different levels of ploidy are under study. For this purpose a series of homozygous yeast strains differing only in degree of ploidy is used.

2951 *Max-Planck-Institut für Kulturpflanzenzüchtung.* (*Max Planck Institute for Breeding Cultivated Plants*). (*p. 581*).
Problems under investigation include hemp breeding, the development of a spinach low in oxalate content and methods of artificial selection.

2952 *Max-Planck-Institut für Virusforschung.* (*Max Planck Institute of Virus Research*). (*pp. 595–96*).
Mutation has been induced in free phage T2 particles [cf. XXIX, 3420] and in *Escherichia coli* [cf. XXX, 69 and 70] by means of nitrous acid.

2953 *Max-Planck-Institut für Züchtungsforschung* (*Erwin-Baur-Institut*). [*Max Planck Institute of Breeding Research* (*Erwin Baur Institute*)]. (*pp. 598–99*).
Studies of polyploid crop plants have shown a relation between ploidy and number of chloroplasts per guard cell [cf. XXX, 2279]. In investigations on cytoplasmic inheritance, treatment with radioactive isotopes was found to induce both plasmon and plastid mutations, some of the former resulting in dedifferentiation of tissues.
Wheat. The *Agropyron intermedium* chromosome which carries resistance to brown and

yellow rust affects both total yield and grain development when present in 44-chromosome addition lines and 42-chromosome substitution lines. Favourable combinations can be selected. Translocation between a resistance chromosome and a wheat chromosome has been demonstrated in two cases.

Rye. Numerous pollen-sterile types have been found among European varieties, but no dependence upon nuclear and cytoplasmic factors such as could be used in breeding heterotic hybrids has yet been found. A marker for colour has proved to be linked with genic pollen sterility. Self-sterile inbred lines are not on the average lower in combining ability than self-fertile lines.

Barley. Studies of diplontic selection of mutated cells induced by seed irradiation have shown that mutation frequency decreases in later-formed ears compared with those formed first. The mean size of the mutant sector increases with increasing radiation dose. A radiation-induced mutant of the spring barley Haisa II ripens about three days earlier and yields about 7% more.

Grasses. Interspecific and intergeneric crosses of *Lolium* and *Festuca* have been effected [cf. XXX, 1619]. The inheritance of an induced mutation for nonshedding grain is being studied in *Phalaris arundinacea* and *Arrhenatherum elatius*.

Lupin. In *Lupinus luteus*, *L. angustifolius* and *L. albus*, lines differing in vernalization requirement were found to differ by only one allele. A larger number of genes determining low alkaloid content has been demonstrated in *L. albus* than in other species. The multiplication and use of low-alkaloid *L. perennis* forms are hampered by the self sterility of this species.

Potato. Parthenogenetic plants with 24 instead of 48 chromosomes have been developed. In addition to *Solanum vernei*, both *S. sanctae-rosae* and *S. multidissectum* have proved resistant to all the nematode populations with which they have been tested. The gene *Ry* exerts a pleiotropic effect, governing immunity to viruses Y and A. Tests of numerous wild species have revealed no sources of immunity from leaf roll, of which 4–6 strains appear to exist. Numerous hybrids resistant to new wart races have been identified. No differences in genome structure leading to disturbances of pairing have been detected in crosses between diploidized *S. tuberosum* and diploid wild species.

Beet. Triploids resulting from crosses between tetraploids and pollen-sterile diploids have given high yields. Sugar beets with good mosaic tolerance have been produced. Studies on the chemical induction of pollen sterility have been carried out [cf. 716]. A method of raising interspecific hybrid seedlings by grafting has been developed [cf. 713].

Malus. Mutation studies have shown that the frequency of primary effects induced is appreciably greater for γ rays than for X rays. The leaves of trees resistant to scab and mildew have a higher content of phenolic compounds than those of susceptible trees, and a higher content of aminoacids.

Ribes. In the selfed progenies of red currant varieties, similarities to the strains composing the varieties could be detected. The hybrid varieties showed no inbreeding depression.

Strawberry. The susceptibility of the tetraploid Monatserdbeere [Perpetual strawberry] to viruses was dominant in crosses with tolerant garden strawberries.

Phaseolus. Progenies of certain mutant plants of *Ph. vulgaris* 'Rotsprenkel' [Red Speckle], induced by S^{35}, contained up to six point mutations. Flavonoid production in *Ph. vulgaris* x *Ph. coccineus* has been studied [cf. XXX, 2064].

Jahrbuch 1959 der Bundesanstalt für Pflanzenbau und Samenprüfung in Wien. (**1959 Yearbook of the Federal Institute for Plant Cultivation and Seed Testing in Vienna**). Bodenkultur 1960 : 11. Sonderheft : Pp. 172.

2954 *Bauer, R. Tätigkeitsbericht 1959.* (*Report on activity 1959*). (*pp. 1–14*).

Brief reports are given of the results of trials of cereals, forage plants and root crops.

2955 *Steinberger, J. Zur Sortendiagnostik von Gerste und Weizen durch die Phenolmethode.* (*The varietal diagnosis of barley and wheat by the phenol method*). (*pp. 27–30*).

The procedure used for wheat grains, which differs somewhat from that for barley [cf. XXX, 2292], is described. The characteristics of the grain, including the phenol reaction of some spring and winter barleys, are listed and also the phenol reactions of some wheats.

2956 *Waltl, K. Tätigkeitsbericht der Qualitätsabteilung.* (*Report on the activity of the Quality Department*). (*pp. 38–49*).

The testing of wheat and malting barley is reported.

2957 *Nietsch, H. Botanische Sortenbeschreibungen.* (*Botanical descriptions of varieties*). (*pp. 50–58*).
Notes are provided on eight winter wheats recently added to the official list.

2958 *Meinx, R. Ergebnisse mehrjähriger Tetraroggenversuche.* (*The results of many years' trials of tetraploid rye*). (*pp. 70–75*).
It was found that tetraploid rye is only suitable for regions with good rainfall and good soil; rich manuring is essential. Under these conditions, tetraploid rye has outyielded diploid varieties. It is not always easy to sell for the millers tend to prefer diploid rye because the tetraploid requires special measures for cleaning.

2959 *Zweifler, E. Ertrag und Reifezeit der Maissorten bestimmen den Anbauwert.* (*The yield and time of ripening of maize varieties determine the value for cultivation*). (*pp. 76–88*).
From the results of numerous trials, Wisconsin varieties are recommended for different regions of Austria.

2960 *Demel, J. Welche Kartoffelsorten eignen sich für den Anbau als Zweitfrucht nach Wintermischling.* (*Which potato varieties are suitable for cultivation as a second crop after a winter mixture?*). (*pp. 89–102*).
Of the five varieties tested, the medium-late Maritta gave the best results after June planting; Allerfrüheste Gelbe [Earliest of All Yellow] and Ackersegen also did well. Earlier varieties were unsatisfactory because they were more susceptible to late blight.

2961 *Wolffhardt, D. Rotklee und Luzerne. Sorten- und Herkunftsprüfungen 1954–1959.* (*Red clover and lucerne. Variety and provenance trials 1954–1959*). (*pp. 141–50*).
Of the foreign clovers tested, those from north and north-western Europe were most suitable for Austrian conditions. Good yields were obtained from some American and north and central European lucernes but those from southern regions were unsatisfactory.

2962 Žečeva, Ž.
(Scientific research institutes dealing with plant production in Poland).
Selskostopan. Misăl 1959 : No. 10 : 794–95. [Bulgarian].
This report on a scientific tour mentions new Polish varieties of potato which are rich in starch and resistant to *Leptinotarsa*. Also mentioned are some new sugar-beet varieties, including monogerm and tetraploid forms; some have a sugar content of 17–21% and are resistant to *Cercospora* and virus yellows.

2963 Wolski, T.
Kilka dalszych informacji o francuskiej hodowli pszenicy i buraka cukrowego. **(Some further information on French breeding work with wheat and sugar beet).**
Postępy Nauk Roln. 1960 : **7** : No. 5 : 149–56.
Impressions of a recent visit to breeding stations in France include comment on the large populations used, this being made possible by simplifying the technique. Comparisons are made between the Polish wheat Wysokolitewka Sztywnosłoma [Stiff-strawed Wysokolitewka] and the French Étoile de Choisy, both of which have a wide range of adaptation, in illustration of the value of breeding wheats of this type.
In sugar-beet breeding, reference is made to hybrids from crossing lines from different groups, whereby heterosis has been obtained not only in yield but in such features as sugar content and resistance to *Cercospora* and virus yellows. One of the Hungarian polyploids, Hungaro 3, has done well in France.

2964 Vilmorin, R. de
Aspects et étapes de la recherche agronomique en France. XI. L'amélioration des plantes cultivées (période 1848–1914). [**Aspects and stages of agronomic research in France. XI. The improvement of cultivated plants (1848–1914 period)**].
CR Acad. Agric. Fr. 1961 : **47** : 73–75.
A brief historical account is given of significant developments in plant breeding between 1848 and 1914. Particular reference is made to the contributions of the Vilmorin family.

Atti del 1° Convegno Nazionale sulle Sementi Elette, Vicenza—Lonigo, 7 Giugno 1959. **(Proceedings of the 1st National Meeting on Selected Seed, Vicenza—Lonigo, 7 June, 1959).**
Genet. agr. 1960 : **12** : Pp. 195.
In addition to the formal addresses, reported in full, a series of papers was presented on the subject of seed production, control and trade. The discussion, also reported in full, centered largely on forthcoming Italian legislation for seed certification and the need to extend it to

cover breeders' rights. The following papers dealt with aspects concerned with genetics and breeding.

2965 *De Cillis, U. Miglioramento e produzione delle sementi di frumento.* (*Improvement and production of wheat seed*). (*pp. 54–58*).
Attention is called to the exceptional speed with which the new wheats produced by Strampelli and others have been introduced into Italian agriculture and to the way in which they have in turn made possible notable advances in cultural practices. Some of them have, moreover, given higher yields in certain other countries, as far apart as Yugoslavia and Argentina, than in Italy itself. The absence of a national variety register in Italy is deprecated.

2966 *Fenaroli, L. La produzione delle sementi ibride di mais in Italia con particolare riguardo all'esportazione.* (*The production of hybrid maize seed in Italy with particular regard to export*). (*pp. 59–71*).
Some remarks already published [XXX, 3868] are repeated and a list is given of the hybrids now being produced in Italy and the conditions established for their certification.

2967 *Borasio, L. Orizzonti sul miglioramento della produzione delle sementi di riso.* (*Prospects of improving seed production of rice*). (*pp. 72–76*).
The advantages that have accrued from the production of improved rice varieties in Italy include the increase in the mean grain yield from 28 c. per ha. in 1910 to 50 c. at present. Some of the best varieties in the classes superfine, fine, semifine and common are named.

2968 *Haussmann, G. Miglioramento e produzione delle sementi di foraggere.* (*Improvement and production of seeds of forage plants*). (*pp. 77–91*).
Further data are presented showing the superiority of Italian ecotypes of lucerne compared with foreign ecotypes [cf. XXVIII, 4313]; the best were the Cremona ecotype and line 202, which gave total yields of 2126·43 c. and 2222·21 c. per ha. respectively over a four-year period, compared with 1964·16 c. from du Puits and 1965·92 c. from Poitou lucernes. Some 80 ecotypes of this and other forage legumes are now available in the form of certified seed and are listed. Figures are cited to show that the quality of the seed reproduced in Italy is generally superior to that from other countries, though foreign ecotypes differ in the yield of seed they give when reproduced in Italy.

2969 *Donà dalle Rose, A. Aspetti del potenziamento e della disciplina della produzione del semebietole.* (*Aspects of the supply and organization of seed production of sugar beet*). (*pp. 132–41*).
Reference is made to the benefits derived from the Italian tests of sugar-beet varieties [cf. 2345], which have shown that at least two Italian diploid cultivars are equal in yield to the best imported strains, including polyploids, the cost of their seed being about 50% less. Polyploid varieties are nevertheless growing in popularity because of their greater resistance to certain diseases and freedom from bolting.

2970 *Morandini, R. Produzione e miglioramento dei semi forestali.* (*Production and improvement of forest seeds*). (*pp. 142–54*).
Various reasons are advanced for the greater rarity of improved cultivars in forest trees than in agricultural crops. The methods of forest-tree breeding are outlined and information is given on the steps that are being taken in Italy to identify the woods that provide the best seeds. The criteria used to select the most promising mother trees are enumerated. Some 70 woods have been selected so far, embracing 12 different species of conifer.

2971 Elagin, I.
(A conference on scientific methods pertaining to breeding and seed production).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 10 : 146–47. [Russian].
This report on a conference held at Odessa in June 1959, dealing mainly with breeding methods, mentions recent varieties of wheat, maize, barley and pea. Worth mention is the high-yielding strong-floured winter wheat Mironovo 264, which was obtained by Mičurinist training of the spring variety Narodnaja [People's]. Also mentioned are new varieties of peas from Uladovo-Ljulincy which have outyielded Victoria Mahndorf by 10%.

2972 Jur'ev, V. Ja.
(50 years of research at the Ukrainian Institute of Plant Industry, Breeding and Genetics).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 7–10. [Russian].
The history of the above institute, where Jur'ev has worked since its foundation in 1909, is discussed and some well known varieties of cereals produced there such as the wheat

Narodnaja [People's], the rye Har'kov 194 and the maize Har'kov 23 are noted. Some recent hard winter wheats have been obtained by crossing soft wheats with hard wheats; the hard spring wheat Har'kov 46 is a hybrid involving *T. durum*, *T. turgidum* and *T. dicoccum*.

2973 Smol'janinov, A. V., Pavlova, E. I. & Vodolazskij, G. S.
(How we obtained reductions in the cost of grain production).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 22–24. [Russian].

This report on improvements in seed production on a farm in the Stavropol' territory mentions the recent introduction of the wheat Hybrid 481 and the barley Kubanec 6322 [barley from Kuban' 6322], which outyielded the wheat Odessa 3 and the barley Pallidum 43 respectively. Reference is made to a new sunflower variety, Armavir 9343, which is rich in oil.

2974 Bingefors, S.
Aktuella förädlingsproblem för Mälar-Hjälmarbygden. **(Current breeding problems in the Mälar-Hjälmar region).**
Sverig. Utsädesfören. Tidskr. 1960 : **70** : 364–74.

The work of the Ultuna branch station of the Swedish Seed Association and of the Örebro substation includes the following:—

Wheat. In attempts to improve its baking quality, the winter wheat Odin has been crossed with numerous varieties, including Eroica I. U01691, a product of these crosses, has shown promise. In breeding for combined earliness, hardiness and stiff straw in eastern Svealand and southern Norrland, promising material has been obtained from crosses among Odin, Virtus, Svea II, Diana and sister varieties of Diana. The early spring wheat Norrøna, which is well suited to the area under consideration but has weak straw, is being used as a parent.

Oats. Attempts are in progress to produce a white oat combining the characteristics of the black oat Stormogul II [Great Mogul II] with white husks, good quality and good straw strength.

Red clover. U056 and U039, two strains with improved resistance to stem eelworm, are being multiplied.

Pea. A new yellow pea with larger seeds, better cooking quality and higher yields than Torsdags III [Thursday III], and equalling the latter in earliness, has been developed at Ultuna.

Among varieties for green fodder, the central Swedish variety Vrm 0584 shows particular promise; it equals Hero in yields of green matter and seed but has a much lower 1000-seed weight.

2975 Arbetsplan för Weibullsholms Växtförädlingsanstalt för år 1961. **(Plan of work for the Weibullsholm Plant Breeding Institute for the year 1961).**
Pp. 42.

Breeding of cereals, forage crops, root crops, oil crops and vegetables is continuing along the same lines as in previous years [cf. XXX, 2306]. The following recent work is reported.

Alsike clover. The tetraploid strain of Balingsta [cf. XXIX, 2306] is being released under the name Tetra.

Spinach. Swedish commercial varieties have been crossed with Netherlands and American material resistant to *Peronospora*.

Lettuce. The X_4 and X_5 generations of X-irradiated material of 131 are undergoing trial. Urania has also been X irradiated and has been treated with the mutagen ethyleneimine.

Celeriac. The productive variety Tellus has been recognized as an original variety [cf. 3102].

Cucumber. Rea, a new F_1 hybrid of the Butchers type to be released in 1961, is early, very productive and highly tolerant of *Corynespora melonis*. Crosses of Netherlands and American varieties resistant to *Cladosporium cucumerinum* with Swedish commercial varieties for outdoor production are now in the F_3 and F_4 generations.

Pea. A new sugar pea, 2160, which is early and productive, is to be released in 1962.

2976 60. beretning om planteavlsarbejdet i landboforeningerne i Jylland, 1960. **(60th report on the crop production work of the agricultural associations in Jutland, 1960).**
1960 (1961) : Pp. 668.

The results of varietal trials of wheat, oats, rye, barley and potato are included in this report on field experiments conducted by local associations in Jutland, Denmark.

2977 Handleiding voor veldproeven. **(Manual for field experiments).**
Meded. LandbVoorlDienst., Wageningen 1960 : No. 77 : Pp. 295.

This new, much revised edition of a practical handbook on field trials [cf. XX, p. 365] includes chapters on: the preparation of field experiments; the administration of field experiments; kinds of experiments; choice of trial

ground; practical information on laying out field trials; fertilizers; sowing and planting; care of the experimental fields; observations and measurements; methods of treatment for the most important crops; sampling; and machinery and equipment.

2978 SALZMANN, R.
Tätigkeitsbericht der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon über das Jahr 1959. (**Report of the work of the Federal Agricultural Research Institute Zürich-Oerlikon for the year 1959**).
Landw. Jb. Schweiz 1960 : **74** : 667–739.
Testing and selection of wheat, oats, rye, barley, maize and forage plants are reported. Varietal trials of root and oil crops are also mentioned.

2979 PRAKSIN, S.
(**Achievements in plant industry in Albania**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 12 : 71–72. [Russian].
Mention is made of T130, a high-yielding wheat bred at the Mičurin Institute in Albania. Inbreeding of local maize has begun.

Probleme actuale de biologie şi ştiinţe agricole. Lucrare dedicata Acad. Prof. G. Ionescu-Şişeşti cu prilejul împlinirii a 75 de ani. (**Current problems in biology and scientific agriculture. A work dedicated to Academician Professor G. Ionescu-Şişeşti on the occasion of his 75th birthday**).
Editura Academiei Republicii Populare Romîne 1960 : Pp. xxi + 780.

2980 *Giosan, N., Puia, I. & Buican, D. Asupra unor aspecte ale relaţiei dintre nutriţia minerală a plantelor şi rezistenţa lor la ger.* (*On some aspects of the relation between the mineral nutrition of plants and their resistance to frost*). (*pp. 79–85*).
A comparative test of 20 wheat varieties showed that the varieties most resistant to frost were best able to take up P^{32} and K^{42} from culture solution at low temperatures.

2981 *Ionescu, M. Caracterele biochimice ale speciei* Zea mais. (*Biochemical characters of the species* Z. mays). (*pp. 95–102*).
Data are provided on the starch, protein and fat contents of some of the principal Rumanian varieties and double hybrids and on the effect of environmental conditions on these components.

2982 *Nyárády, E. I. Situaţia actuală a cercetărilor din R.P.R. asupra subgenului* Eubatus. (*The present situation of investigations in the Rumanian People's Republic on the subgenus* Eubatus). (*pp. 143–52*).
An outline is given of the distribution of the numerous Rumanian species of the above taxon. These have been described, many for the first time, in the fourth volume of the Flora of the Rumanian People's Republic.

2983 *Péterfi, Ş., Brugovitzky, E., Osváth, T. & Kiss, A. Variaţia unor caractere biochimice la cîteva soiuri de viţă de vie in cursul perioadei de vegetaţie.* (*Variation of some biochemical characters in some vine varieties during the vegetative period*). (*pp. 153–63*).
The content of total and reducing sugars, dry matter, ash and acids was determined in the fruits and vegetative organs of six varieties throughout the vegetative cycle. Although the general trend of biochemical change was similar for all varieties, definite intervarietal differences were noted.

2984 *Pop, E. & Puia, I. Despre relaţia dintre permeabilitatea protoplasmei pentru apă şi rezistenţa plantelor la ger.* (*On the relation between the permeability of the protoplasm to water and the resistance of the plants to frost*). (*pp. 165–69*).
The relation between the capacity of the cells to take up water from sucrose solutions and frost resistance was studied in a series of wheat and barley varieties. Some evidence was obtained of a correlation between frost resistance and water-absorbing capacity at low temperatures (over 0° C.).

2985 *Puşcaş, M., Baia, V. & Stoiciu, T. Influenţa temperaturii asupra vitezei de imbibţie a cariopselor de porumb hibrid.* (*The influence of temperature on the speed of imbibition of hybrid-maize caryopses*). (*pp. 181–86*).
Some imported double hybrids and Rumanian intervarietal hybrids were studied, information being obtained on rate of imbibition at 10–12 and 26° C. For obtaining good stands on cold dry soils, hybrids such as Warwick 311 and Romînesc de Studina [Studina Rumanian] x ICAR54, with a high imbibition rate and low subsequent water requirement, are recommended.

2986 *Turbin, N. V. Despre selecția pentru aprecierea valorii combinative la plante.* (*On selection for determining the combining ability of plants*). (*pp. 237–43*).

The use of top crossing, the polycross method, and a variant of the latter devised by the author involving open pollination, each variety being sown along 1–2 rows with 3 replications, for the estimation of general and specific combining ability are discussed. A test of Soviet maize lines by means of the third method is described.

2987 *Andronicescu, D., Enăchescu, G. & Tălpălaru, E. Contribuții la studiul fenomenului de heterozis la tomate.* (*Contributions to the study of the phenomenon of heterosis in the tomato*). (*pp. 247–51*).

Information is provided on the yield and content of dry matter, sugar, acids and ascorbic acid in a series of F_1 intervarietal hybrids raised at the Țigănești research station, Rumania. The combinations 10 x Bison and Zarja [Dawn] x Comet were most promising. [Cf. XXVI, 3900].

2988 *Angelini, F. Résultats des recherches agronomiques sur la culture de la betterave à sucre—en semailles d'automne—, dans les régions chaudes-sèches de l'Italie méridionale.* (*Results of agronomic investigations on sugar-beet cultivation—in autumn sowings—in the hot, dry regions of southern Italy*). (*pp. 253–63*).

Klein AA and Cesena AA, both of which showed resistance to bolting, gave best results in a series of trials conducted in southern Italy.

2989 *Brežnev, D.* (*Environmental conditions as a factor in the formation of characters and quality in tomatoes*). (*pp. 323–32*). [*Russian*].

Evidence is provided on the variability in morphological characteristics, fruit quality, yield and earliness of a number of tomato varieties grown from seed produced in different environments. The changes acquired by tomato varieties in an altered environment are regarded as heritable. The responses of different varieties to identical environments were not always of the same kind. For instance, the highest yields of two varieties were obtained by using seed produced at Stalingrad, but the yield of one variety was higher from Majkop-produced seed than from Verhnjaja Hava seed, while the reverse was true for the other variety. Mention is made of training tomatoes to germinate at temperatures of 9–13° C. In the variety Urožajnyj [Productive] the germination percentage rose from 42% in the first year to 46% in the second and 88% in the third.

2990 *Ceapoiu, N. & Itoafă, E. Cercetări în domeniul experimentării și ameliorării cînepei monoice executate în R.P.R.* (*Experimental researches and improvement of monecious hemp carried out in the Rumanian People's Republic*). (*pp. 351–55*).

The German monecious variety Fibrimon has greatly outyielded the diecious standard ICAR 42/118. Numerous monecious lines have been obtained by selection of spontaneous variants, hybridization and inbreeding. The fibre contents range from 23 to 28%.

2991 *Cîlniceanu, C., Miclea, C. & Mihalca, V. Treizeci de ani de cultură a grîului A 15.* (*Thirty years' cultivation of the wheat A15*). (*pp. 381–90*).

The breeding history of this widely grown Rumanian wheat is described. Being somewhat heterogeneous now, a number of selections have been made within it, and it has been used extensively in Rumanian hybridization programmes.

2992 *Constantinescu, G. & Negreanu, E. Soiuri noi de Coarnă neagră: Coarnă neagră selecționată, Coarnă neagră aromată și Coarnă neagră tămîioasă.* (*New varieties of Black Coarnă: Selected Black Coarnă, Aromatic Black Coarnă and Muscat Black Coarnă*). (*pp. 401–07*).

Descriptions are given of the above three hermaphrodite varieties, all obtained by open pollination of the female variety Coarnă neagra. All outyielded Coarnă neagra; the second has berries with a bouquet of roses and the third has a pronounced muscat flavour.

2993 *Gologan, I. & Scumpu, N. Contribuții la stabilirea rezistenței la iernare a unor linii noi de orz de toamnă.* (*Contributions towards establishing the resistance to winter damage of some new winter-barley lines*). (*pp. 441–46*).

Six new lines and the standard Cenad 396 were studied at the Iași research station. Studies on overwintering in the field and freezing tests in the laboratory gave largely concordant results; Cenad 396 resisted freezing best, followed by Bărăgan 391, the converse holding for the field tests. The rate of loss of water from harvested leaves did not provide an efficient indication of winter hardiness. [Cf. XXX, 2338].

2994 *Hulpoi, N. Obținerea de recolte mari de porumb în incinta îndiguită "Brăila-Dunăre-Siret". (Obtaining good maize harvests in the area defined by Brăila, the Danube and Siret).* (*pp. 457–63*).

A paper on varietal trials of several crops in the above area has been summarized previously [XXX, 2367]. The present paper deals with maize trials during 1956–59. The highest yield was given by the double hybrid Pioneer 301.

2995 *Kiričenko, N. I. (Methods and results in the work on breeding hard winter wheat for the steppe in the USSR).* (*pp. 479–87*). [*Russian*].

[Cf. XXX, 1437].

2996 *Musijko, A. S. (Methods used in maize breeding and the results obtained).* (*pp. 517–22*). [*Russian*].

Additional information on maize breeding at Odessa is provided [cf. XXX, 2618]. Odessa 23 and Odessa 27 were obtained from pollination of the male-sterile single cross Slava [Glory] ♀ by Odessa Gruševka and Voronež 76 respectively. Odessa 23 is earlier and more productive than the double cross VIR 42 [Institute of Plant Industry 42] while Odessa 27 is more satisfactory in these respects than the double cross VIR 25. Many inbreds obtained from diverse material have been tested for combining ability and several new high-yielding double crosses are now available.

2997 *Neagu, M. & Georgescu, M. Noi hibrizi naturali de cireș cu coacere semitimpurie. (New spontaneous cherry hybrids with midseason maturation).* (*pp. 523–27*).

This paper is the extended version of an earlier publication [XXX, 4255].

2998 *Popescu, Ș. Varietăți noi de grîu. (New varieties of wheat).* (*pp. 567–69*).

Two new botanical varieties pertaining to group *ligulatum* have been discovered in fields of local populations in northern Moldavia: var. *picturatum*, with white spikelets, and var. *rubropicturatum*, with red spikelets.

2999 *Priadcencu, A., Avrămăoaie, P., Boldea, E. & Moisescu, L. Comportarea grîului de toamnă A15 provenit din semințe iradiate cu raze x și neutroni termici. (The behaviour of samples of the winter wheat A15 grown from seed irradiated with X rays or thermal neutrons).* (*pp. 581–91*).

Mutants characterized by increased yield, earlier maturation, improved baking quality and greater resistance to lodging and brown rust have been obtained by the above treatments. Cytological aberrations observed in the R_1–R_3 are described.

3000 *Rădulescu, E. Realizări și perspective în crearea de soiuri noi de grîu de toamnă rezistente la rugina brună*—Puccinia triticina *Erikss.*—*și mălură*—Tilletia foetida (*Bauer*) *Liro. [Achievements and prospects in breeding new varieties of winter wheat resistant to brown rust,* P. triticina *Erikss., and bunt,* T. foetida (*Bauer*) *Liro].* (*pp. 601–05*).

Combined resistance to the above pathogens has been obtained at Cluj by crossing Ridit with a number of Rumanian selections.

3001 *Săulescu, N. Grîne Italiene în R.P.R. (Italian wheats in the Rumanian People's Republic).* (*pp. 657–61*).

Trials of 21 Italian varieties in Rumania are reported. These were superior to Rumanian wheats in yield, earliness and lodging resistance but fell short in baking quality and frost resistance.

3002 *Velican, V., Pop, O. & Roman, A. Studiul unor noi linii de orzoaică. (A study of some new lines of two-rowed barley).* (*pp. 751–57*).

Trials of a series of selections made from hybrids effected at Cluj are reported. The best performances were given by the following: Cluj 1102 (Precocius 0143 [Early 0143] x Ariste netede [Smooth Awned]), with 10·1% protein and a high starch content; Cluj 778 (Cluj 123 x Golaș [Naked]), with 10·8% protein; and Cluj 451 (Opal x Cluj 123).

3003 **General Reports of the Chinese-American Joint Commission on Rural Reconstruction, Taipei, Taiwan 1957** : No. 8 : Pp. 107; 1958 : No. 9 : Pp. 115; 1959 : No. 10 : Pp. 126.

In the chapter on Crops and fertilizers in each of the above reports, information may be found on the part played by the commission in the breeding or introduction of improved varieties of cereals and other crops, and their distribution. In rice and groundnut, the possibility of inducing useful mutants by treatment with radiation is being explored. R_4 and R_5 selections of rice have shown promise with respect to earlier maturity, greater resistance to blast and stiffer straw. Groundnut selections from irradiated material include many which have proved to be fairly resistant to artificial inoculation with *Sclerotium* wilt.

Annual Report of the National Institute of Genetics, Japan 1959 (1960) : No. 10 : Pp. vi + 162.

3004 *Kihara, H. Interaction of Aegilops cytoplasm and various wheat nuclear complements.* (*pp. 36–37*).

A ♂ sterile strain (SB_8) with the nucleus of *Triticum vulgare* and the cytoplasm of *Ae. caudata* was crossed twice to *T. vulgare*, *T. spelta*, *T. compactum*, *T. macha* and *T. durum*. The F_1s and BC_1s of SB_8 x *T. vulgare* and SB_8 x *T. spelta* were ♂ sterile and ♀ fertile; *T. vulgare* and *T. spelta* are concluded to have the same genotype with regard to ♂ sterility in *Ae. caudata* cytoplasm. The F_1 from SB_8 x *T. compactum* was ♂ sterile and ♀ fertile but the BC_1 generation segregated for this character, some plants showing fully restored fertility. It is concluded that *T. compactum* carries a recessive gene or genes for restoration of ♂ fertility. Crosses between SB_8 and *T. macha* were lethal, indicating that *T. vulgare* and *T. macha* carry complementary dominant lethal genes. The F_1 of SB_8 x *T. durum* was ♂ sterile and ♀ fertile. When back crossed to *T. durum* the progeny were ♂ and ♀ sterile and it is concluded that normal gametogenesis is inhibited by *Ae. caudata* cytoplasm; it is suggested that female sterility may be controlled by a recessive gene in *T. durum*.

3005 *Kihara, H. & Nezu, M. Genome analysis in the genus* Oryza. (*pp. 37–39*).

Studies on chromosome pairing at meiosis in F_1 hybrids between *O. sativa* and a number of diploid and tetraploid species indicate that *O. sativa* var. *spontanea*, *O. perennis*, *O. glaberrima* and *O. breviligulata* have genomes homologous with that of *O. sativa* while *O. officinalis* and *O. australiensis* have different genomes. *O. minuta* (tetraploid) has one modified *O. sativa* genome and one *O. officinalis* genome.

3006 *Kihara, H. & Katayama, T. Application of SUMP method in taxonomic studies in* Oryza. (*pp. 39–40*).

Using Suzuki's universal microprinting method the surface structure of the lemma was examined in 18 species belonging to sections *Sativa*, *Granulata*, *Coarctata* and *Rhynchoryza*. In section *Sativa* the epidermal cells are square or rectangular in shape and each bears a round tubercle. Cells in *Granulata* species are rectangular and bear a tubercle composed of several "tuberclets". Species of section *Coarctata* show great variation but the cells are generally slender and without tubercles. In section *Rhynchoryza* the cells are polygonal and bear a globe-shaped tubercle from which furrows radiate.

3007 *Katayama, T. Studies on germination in* Oryza. (*pp. 40–41*).

It was possible to group rice species into four classes based on germination behaviour. In the first group, germination occurs 1–2 days after sowing with no further increase in germination percentage; this group includes *O. sativa* and *O. glaberrima*. In the second group, germination begins within 2–3 days after sowing and increases gradually; some seeds germinated 270 days after sowing. This group includes *O. sativa* var. *spontanea* and *O. perennis*. In the third group germination begins 5–6 days after sowing and increases during the next three weeks up to a maximum of 70%; *O. granulata* belongs to this group. In the fourth group, germination begins 2–3 days after sowing and reaches a maximum within 10 days; to this group belong *O. alta*, *O. australiensis*, *O. brachyantha*, *O. breviligulata*, *O. eichingeri*, *O. latifolia*, *O. minuta*, *O. officinalis*, *O. ridleyi* and *O. subulata*.

Investigations into the effects of gibberellin and indole-3-acetic acid on germination revealed wide differences in reaction among the species; the treatments had little effect on cultivated rice.

3008 *Katayama, T. Studies on the flowering time of genus* Oryza. (*pp. 42–43*).

Observations on 18 species show that those which are closely related to *O. sativa* resemble this species in flowering behaviour. Most of the wild species examined opened earlier in the morning than *O. sativa* but *O. australiensis* and *O. coarctata* opened in the afternoon. The species are classified into three groups: (1) flowering not affected by climatic conditions, (2) time of flowering varying with time of sunrise and (3) flowering determined by temperature.

3009 *Katayama, T. Photoperiodic responses of* Oryza *species II.* (*pp. 43–44*).

The number of short-day treatments required to induce flowering was found to increase in the order *O. sativa*, *O. glaberrima*, *O. sativa* var. *spontanea* and *O. perennis*. Variation in photoperiod sensitivity and critical day length decreased in the same order. The number of treatments required was smaller in plants collected from higher latitudes than in those from lower latitudes. An experiment on the same lines as that reported for wild rice [cf.

1593] was conducted with 383 cultivars; the data indicate that while a similar correlation between critical day length and latitude exists, this is less pronounced than in wild species.

3010 *Tsunewaki, K. Monosomic analysis of lethal factors in common wheat.* (*pp. 45–46*).
[Cf. 3172].

3011 *Hu, C.-H. & Takenaka, Y. The karyotype and intra-genome pairing of chromosomes in haploid plants of* Oryza glaberrima. (*p. 47*).
In haploid plants of both *O. glaberrima* and *O. sativa*, nine types of chromosome could be identified. No caryotypic differences were noted and the frequencies of bivalents, trivalents and secondary associations did not differ significantly in the two species.

3012 *Morishima, H. & Oka, H.-I. Systematic studies in the genus* Oryza *by statistical methods.* (*pp. 48–49*).
Further studies based on 42 characters confirm the earlier findings [cf. 1588] and indicate that Roževic's section *Sativa* can be divided into two distinct groups, one represented by *O. sativa, O. perennis, O. sativa* var. *spontanea, O. glaberrima* and *O. breviligulata* (the *Sativa* group) and the other by *O. officinalis* and six related species (the *Officinalis* group). It is suggested that these two groups represent the main lines of evolutionary progress in the genus *Oryza*.

3013 *Morishima, H. & Oka, H.-I. Variation studies in wild rice species,* Oryza perennis *and* O. sativa *f.* spontanea, *by multivariate analysis.* (*pp. 49–51*).
From studies on Asian material it is concluded that there is no clear differentiation between *O. perennis* and *O. sativa* var. *spontanea* and that these represent the extreme forms of a group showing continuous variation.

3014 *Hinata, K. & Oka, H.-I. Hybrid sterility relations among cultivated and wild strains of rice.* (*pp. 51–53*).
Formulae were constructed on the basis of F_1 pollen fertility values obtained by crossing strains of *Oryza perennis* and *O. sativa* var. *spontanea* with each of five test strains of *O. sativa* representing Continental, Temperate-Insular and Tropical-Insular types. The data from these and earlier studies on hybrid sterility among cultivars [cf. XXV, 2017] show the wild strains to be intermediate between Continental and Insular cultivars and suggest that differentiation of wild strains into Continental and Insular forms is little advanced.

3015 *Oka, H.-I. & Chang, W.-T. Variation in hybrid sterility with certain test strains within populations of wild rice.* (*pp. 53–54*).
While F_1 generations from *Oryza sativa* var. *spontanea* x *O. sativa* are generally fertile, some semisterile hybrids were produced when *O. sativa* 'Taichung 65' was used as one parent. In the *O. perennis* population studied, semisterility occurred not only in F_1 hybrids but also in self-pollinated plants.

3016 *Morishima, H., Hinata, K. & Oka, H.-I. An investigation of floating habit in wild rice species.* (*pp. 54–55*).
The ability to adopt a floating habit was found in all *Oryza perennis* strains tested under deep water conditions. *O. sativa* var. *spontanea* strains also showed this character but to a lesser extent. Cultivated varieties could be clearly distinguished into floating and non-floating types.

3017 *Morishima, H. & Oka, H.-I. Variation in seed dormancy of wild rice species.* (*pp. 55–56*).
Seed dormancy was stronger in *Oryza perennis* and *O. sativa* var. *spontanea* than in *O. sativa*. Strains morphologically intermediate between *O. perennis* and *O. sativa* var. *spontanea* however had the weak dormancy characteristic of cultivars.

3018 *Oka, H.-I. & Chang, W.-T. Variation in photoperiodic response among wild rice population of Thailand.* (*pp. 56–57*).
Results similar to those reported for the mainly Indian material examined previously [cf. 1594] were obtained in experiments with Siamese strains of *Oryza perennis* and *O. sativa* var. *spontanea*.

3019 *Oka, H.-I. & Chang, W.-T. The impact of cultivation on populations of wild rice,* Oryza sativa *f.* spontanea. (*pp. 57–58*).
[Cf. XXX, 2706].

3020 *Oka, H.-I. Distribution of the glutinous gene in wild and cultivated populations of rice in Thailand.* (*pp. 58–59*).
The frequency of the glutinous gene *gl* in seven samples of cultivated glutinous rice varied from 97% to 62%. Among 14 populations of *Oryza perennis* and *O. sativa* var. *spontanea* which were surrounded by glutinous rice, six were

nonglutinous, six carried *gl* at low frequency and two had frequencies of 28 and 26% respectively for this gene. The ++, +*gl* and *glgl* groups differed very little in mean seed length; within the groups variance was lowest in *glgl* types.

3021 *Oka, H.-I. & Chang, W.-T. Population-genetic studies of wild rice of Taiwan.* (*pp. 59–60*).

Seeds collected from three wild populations of *Oryza perennis* gave rise to plants with many of the characters of cultivated rice when grown in an experimental field in Taichung. The frequency of plants heterozygous for genes determining seed length and width was considerably higher than expected on the assumption that the population was not affected by selection. It is concluded that wild rice populations may absorb a large amount of genetic material from cultivated plants and that this is released during sexual propagation.

3022 *Oka, H.-I. Variation in yielding capacity among isogenic lines of rice.* (*pp. 60–61*).

The high-yielding variety Taichung 65 was crossed with the early-maturing varieties Tatong-tsailai from northern China and Bozu 5 [Bonze 5] from Japan. After back crossing repeatedly to Taichung 65 some lines were obtained which have the yield and growth habit of the latter but mature 15–19 days earlier.

3023 *Sakai, K.-I. Genetic variability in established varieties of rice.* (*pp. 61–62*).

Heritability studies on seed length and width, yield, plant height and tiller number in three varieties, H105, H106 and H501, revealed considerable variability within the strains. Heterogeneity was greatest in H106 and least in H105.

3024 *Sakai, K.-I., Narise, T. & Iyama, S.-y. Variability of seed size characters in wild rice.* (*pp. 62–63*).

Variations in seed length and width were found within and between six *Oryza perennis* populations from the west coast of Ceylon.

3025 *Narise, T. & Iyama, S.-y. Variation in anthesis in wild rice populations* (Oryza sativa *f.* spontanea) *collected in India and Ceylon.* (*pp. 64–65*).

Variations within and between populations were statistically significant.

3026 *Sakai, K.-I. & Narise, T. Further note on natural crossing in wild rice.* (*p. 65*).

Under natural conditions, outcrossing was considerably higher among *Oryza sativa* var. *spontanea* populations than among cultivars.

3027 *Narise, T. & Sakai, K.-I. Competition experiment with wild rice.* (*pp. 66–67*).

In competition with cultivars, *Oryza perennis* populations showed a reduction in plant weight and tiller number. *O. sativa* var. *spontanea* showed a reduction in tiller number only.

3028 *Iyama, S.-y. Propagating capacity and competitive ability of the F_1 hybrid between upland rice and "red rice".* (*pp. 67–68*).

The F_1 hybrids showed heterosis in a number of characters and, despite the occurrence of semisterility, produced more seeds per plant than the upland parents. When grown together with the latter the hybrids had strong competitive ability.

3029 *Sakai, K.-I. Seasonal sterility of rice in Ceylon.* (*p. 69*).

Seed sterility varied with time of planting and was highest in April–June and September–October plantings. Varietal differences were found.

3030 *Sakai, K.-I. & Rodrigo, P. M. Studies on a laboratory method of testing salinity resistance in rice varieties.* (*pp. 70–71*).

Varieties known to be resistant or nonresistant under field conditions could be distinguished under laboratory conditions by transferring 40-day-old seedlings into a 1–1·5% salt solution and evaluating after eight days.

3031 *Narise, T. Variation in susceptibility to Piricularia disease in wild rice populations.* (*pp. 72–73*).

Oryza sativa var. *spontanea* populations from India and Ceylon exhibited great variability, both between and within populations, in response to inoculation with *P. oryzae*. A population collected from Samalkot, Andhura, India, was highly resistant to the disease.

3032 *Matsumura, S. & Katsuya, K. Susceptibility of nullisomic wheat dwarfs and their respective gigas-plants to leaf rust,* Puccinia triticina. (*p. 73*).

Dwarf and gigas forms appearing in the progeny of *Triticum polonicum* x *T. spelta* [cf. XXVII, 3811] were tested for resistance to *P. triticina* '21B'; the first parent is susceptible while the second is resistant. Since all e dwarfs and their gigas strains were susceptible, it is concluded that the resistance gene is located on chromosome e of the D genome. A g dwarf strain was susceptible but a gigas strain originating from another g dwarf was resistant. The c dwarfs and their gigas forms exhibited resistance to

moderate resistance and b dwarfs and their gigas forms were also resistant. While a dwarfs were resistant, both resistant and susceptible plants were found among the corresponding gigas forms; it is thought that the extra chromosomes of resistant and susceptible gigas plants may be different. "Among d- and f-dwarfs resistant and susceptible strains were found and also the corresponding gigas-strains showed resistance and susceptibility, respectively." It is assumed that susceptibility genes are carried by chromosomes of genomes A and B as well as those of D.

3033 *Fujii, T. Recovery of chlorophyll content in some mutants in einkorn wheat,* Triticum monococcum flavescens. (*p. 74*).

The chlorophyll mutants *basi-viridis* III, *virido-albina* II and *xantha-alba* I recovered almost normal chlorophyll content when kept in a phytotron. Recovery was faster when the mutants were cultured on nutrient agar than when grown in soil. *Albina* and *albina*-like plants obtained from *virido-albina* x *basi-viridis* II failed to develop chlorophyll on either culture medium. *Virido-albina* mutants which, in an earlier experiment [cf. XXX, 2494], failed to develop chlorophyll after their green leaf-tips had been removed, also failed when grown on agar.

3034 *Ono, Y. & Fujii, T. Amount of amino acids in the chlorophyll mutants of einkorn wheat.* (*pp. 75–76*).

Albina and *virido-albina* mutants of *Triticum monococcum* var. *flavescens* differed from *chlorina* and normal strains in their content of free and combined aminoacids.

3035 *Katsuya, K. Susceptibility of wild rice to blast fungus,* Piricularia oryzae. (*pp. 76–77*).

In tests with *P. oryzae* '[P2]' and '54–04', *Oryza minuta* was resistant to both strains; *O. officinalis* and *O. glaberrima* strains were resistant to both when sprayed and resistant or moderately resistant when injected. *O. perennis* 'W0034' and *O. sativa* var. *spontanea* 'W0150' were moderately susceptible or susceptible to both strains whether sprayed or injected. However *O. sativa* var. *spontanea* 'W0106' and 'W0123' and *O. perennis* 'W0032' and 'W0033' exhibited resistance when sprayed and resistance or moderate resistance when injected. Intra-strain differences were noted in some strains of *O. perennis, O. sativa* var. *spontanea* and *O. glaberrima.*

3036 *Katsuya, K. Susceptibility of the albina mutant of einkorn wheat to leaf and stem rusts,* Puccinia triticina *and* P. graminis. (*p. 77*).

Albina mutants of *Triticum monococcum* var. *flavescens* were susceptible to both *P. triticina* '21B' and *P. graminis* f. sp. *tritici* '21' while normal plants were susceptible only to the latter. Stem-rust susceptibility was greater in the mutants than in normal plants; it is considered that susceptibility is not necessarily related to quantitative differences in chlorophyll content.

3037 *Takenaka, Y. Cytogenetic studies of the genus* Nicotiana *XII.* (*pp. 77–79*).

Meiosis was studied in PMCs of five F_1 interspecific hybrids. (1) *N. debneyi* ($n = 24$) x *N. otophora* ($n = 12$). The number of bivalents ranged from 0 to 6 with the mode at 2 and it was not possible to determine whether chromosomal affinities are allosyndetic or autosyndetic between subgenomes of *N. debneyi* which may be of amphidiploid origin. (2) *N. knightiana* ($n = 12$) x *N. rustica* ($n = 24$). Twelve bivalents and 12 univalents were found in most cells. Since *N. knightiana* is closely related to *N. paniculata,* which is thought to be one of the parents of amphidiploid *N. rustica,* the 12 bivalents are considered to represent *N. knightiana* and *N. paniculata* genomes. (3) *N. repanda* ($n = 24$) x *N. palmeri* ($n = 12$). The number of bivalents ranged from 0 to 9 with the mode at 6. While the author's observations are not in complete agreement with those of Goodspeed [cf. XXVI, p. 131], the latter's view that *N. palmeri* is a descendant of one of the progenitors of *N. repanda* is considered to be correct. (4) *N. bigelovii* ($n = 24$) x *N. megalosiphon* ($n = 20$). Bivalents were very rare in this hybrid and, in many cells, a restitution nucleus was formed without the completion of the first division. (5) *N. trigonophylla* ($n = 12$) x *N. palmeri* ($n = 12$). Twelve bivalents were formed and meiosis proceeded regularly; no bridges or univalents were observed. The hybrid was fertile and produced a large number of seeds; the species appear to be closely related. [Cf. 1597].

3038 *Takenaka, Y. Structural changes of chromosomes of* Allium scorodoprasum *var.* viviparum. (*pp. 79–80*).

Comparative studies were made on chromosome morphology and pairing in one Japanese and two Formosan varieties. The Japanese variety had $5_{II} + I_{VI}$ (ring) in 73% of cells examined. Hokunin had the same configuration in 47% of

its PMCs and $4_{II} + 1_{VIII}$ (ring) in 22%. In Nakotsu, 49% of cells had $4_{II} + I_{VIII}$ (ring) while 24% had $3_{II} + 1_X$ (ring). On the assumption that *A. scorodoprasum* var. *viviparum* is of hybrid origin [cf. XXVII, 1224], it is concluded that, since its establishment, the species has changed or is changing its chromosomal structure. The changes appear to involve chromosomes d, d^1 and g since the relative lengths of these chromosomes differ with variety.

3039 *Furusato, K. & Miyazawa, A. Selection for high content of nornicotine.* (*p. 80*).

Eighteen plants with high nornicotine content and low nicotine content have been selected from (*Nicotiana sylvestris* x *N. tomentosiformis*) x Bright Yellow.

3040 *Furusato, K. Influence of environment on the fertility of tobacco.* (*p. 80*).

The cross *Nicotiana rustica* ♀ x *N. tabacum* ♂ yielded 134 viable seeds in experiments conducted under low temperature conditions; no viable seeds were obtained from the reciprocal cross under the same conditions.

3041 *Lilienfeld, F. A. A case of different results from reciprocal crosses.* (*pp. 81–82*).

Reciprocal F_1 hybrids between D (dusky green cotyledons) and S (shiny green) strains of *Medicago truncatula*, both with normal chlorophyll content, differed in degree of chlorophyll deficiency, D x S hybrids being considerably paler than S x D types. The former became slightly greener during development but flowering was delayed and fewer flowers were produced compared with S x D hybrids. The F_2 generations were similar in both crosses and were characterized by stunted growth and various degrees of chlorophyll deficiency; it is therefore concluded that the reciprocal differences are differences in degree. The occurrence of growth inhibition as well as *albina* types in the F_2 is attributed partly to intensified plasma or plastid sensitivity of certain gene combinations and partly to gene segregation; an independent gene or group of genes is postulated to have semilethal effects which are not related to chlorophyll content.

3042 *Doida, Y. Developmental studies in the genus* Polygonum *III.* (*pp. 82–83*).

The diploid chromosome numbers of twenty-one species are reported. A basic number of 12 is reported for some species.

3043 *Sakai, K.-I. Biometrical analysis of matroclinal inheritance in rice.* (*pp. 86–88*).

[Cf. 484].

3044 *Iyama, S.-y. Effect of matroclinal inheritance on the genetical variation in a hybrid population of autogamous plants.* (*p. 88*).

The following formula is proposed for matroclinal inheritance: $P_n = (1 - m)G_n + mP_{n-1}$, where P_n and G_n stand for the genetically determined phenotypic value and genotypic value, respectively, of an F_n individual and m for the ratio of cytoplasmic effect to total hereditary effect; m may have any value between 0 and 1. For a pair of genes A and a where the values of the three genotypes AA, Aa and aa are assumed to be d, h and $-d$, respectively, the mean value of the F_n progeny from AA x aa or aa x AA crosses of autogamous plants will be $\pm m^n d + \frac{(1-m)(1-2^n m^n)h}{2^{n-1}(1-2m)}$, the sign being positive for AA x aa and negative for aa x AA crosses. General formulae for obtaining variances and covariances in various generations of hybrid progenies have been worked out. According to the result of this study the cytoplasmic effect progressively reduces the additive genetic variance as m increases. When m is small the cytoplasmic effect disappears in a few generations but when m approaches 1 the effect extends to the later generations. The ratio of genetic variance to total phenotypic variance and parent-progeny correlations were computed for different values of m; both values become smaller as the cytoplasmic effect increases. "Genetic correlation, however, becomes larger as the cytoplasmic effect increases."

3045 *Sakai, K.-I. & Pinto, M. E. R. Biometric-genetical study of seed size characters in cultivated varieties of rice.* (*pp. 88–90*).

Six F_2 populations, 6 pure-line selections, 5 local varieties and 8 varieties of hybrid origin were investigated for genetic variability in seed-size characters. In agreement with expectation the F_2 populations had the highest heritability values for seed length and width; local varieties came next, followed by varieties of hybrid origin, with pure-line varieties last. Genetic correlation was very low in the F_2 populations and high in established varieties.

3046 *Kimura, M. A formula giving the effective population number based on the sampling variance in gene frequency.* (*p. 96*).

A formula is derived for effective population number based on sampling variance in gene frequency. This differs from an expression

previously derived by Crow in substituting $\left(\frac{N^{(t-1)}}{N^{(t-1)}-1}\right)\sigma_k^2$ for σ_k^2. For large populations, the differences between the two expressions are negligible.

3047 *Kimura, M. Some calculations on the mutational load.* (*pp. 97–99*).
[Cf. 2897].

3048 *Kimura, M. On the substitutional load of a population.* (*pp. 100–01*).
[Cf. 2897].

3049 *Kimura, M. Substitutional load as a measure of gain in genetic information.* (*pp. 101–02*).
[Cf. 2897].

3050 *Nakai, S. A relation of metabolism to UV induced mutation in yeast.* (*pp. 113–14*).
The effect on mutation frequency of purine-pyrimidine and aminoacid synthesis during the sensitive postirradiation period was studied in ultraviolet-irradiated *Saccharomyces cerevisiae*. From the results obtained, the hypothesis is put forward that the metabolic process involved in mutation establishment comprises at least the four following sequential steps: (1) in which purine-pyrimidine synthesis decreases the frequency of mutation, presumably by the repair of radiation damage; (2) in which purine-pyrimidine synthesis promotes mutation frequency; (3) in which aminoacid synthesis promotes mutation frequency; and (4) in which purine-pyrimidine again promotes the occurrence of mutations.

3051 *Yoneda, Y. Cytological studies on the nucleus of yeast.* (*pp. 114–15*).
The nucleus of *Saccharomyces cerevisiae* is a small spherical body attached to the large central vacuole. The resting nucleus consists of a semilunar Feulgen-positive substance occupying one side of the nuclear cavity and a Feulgen-negative caryoplasm. In a nucleus stained with Giemsa, a densely-staining granule was observed in the caryoplasm. During budding, the Feulgen-positive substance gave rise to four globular bodies in the haploid strain studied; the densely-staining granule also divided. Meiosis was studied in a tetraploid strain stained with Giemsa; at prophase I, entangled thread-like chromosomes were observed which gradually shortened. At metaphase I, shortened bivalents were observed, "the number of which was probably eight". At this stage the densely-staining granule was also visible.

3052 *Nawa, S. & Saito, K. Relation of post-irradiation treatments to radiation-induced mutation frequency in yeast.* (*p. 127*).
Ultraviolet-irradiated cells of *Saccharomyces* sp. showed a greater increase in mutation frequency when plated on incomplete media. Cells incubated in complete media containing chloramphenicol showed a higher frequency of mutations than those grown without chloramphenicol. It is concluded that chloramphenicol prevents the reversion of potential mutations in this material.

3053 *Yamada, Y. Doubling dose as a common unit of measuring mutabilities in polygenes and major genes.* (*pp. 132–33*).
The doubling dose for a polygenic system, as for a major gene, is equivalent to the amount of radiation necessary to double the number of mutants per gene per generation and is obtained by the formula $D_2 = \frac{m}{k}$, where D_2, m and k are the doubling dose, the spontaneous rate of genetic variance increase per generation and the induced rate of genetic variation per unit dose of radiation, respectively.

3054 *Matsumura, S. Comparison of radiation effects of β and γ-rays on einkorn wheat.* (*pp. 136–37*).
Findings on the relative effects of β-ray dosages from P^{32} and I^{131} sources and γ-ray dosages from a Co^{60} source which were reported in an earlier paper [cf. 1614] were generally confirmed by new observations on germination rate, height of 3-week-old seedlings, survival rate, plant height, fertility in the X_1, chromosome aberrations in PMCs and occurrence of chlorophyll mutants in the X_2 of *Triticum monococcum* var. *flavescens*.

3055 *Matsumura, S. Radiation effects of fast and thermal neutrons on wheat. A. Genetic effects of neutrons on einkorn wheat.* (*pp. 138–40*).
Based on experiments with *Triticum monococcum* var. *flavescens*, the 1 r. equivalent effects produced by thermal neutrons compared with X and γ irradiation at 10 and 20 kr. are calculated as follows: for seedling growth, 1 r. = $2{\cdot}0 \times 10^9 n_{th}/cm.^2$; for seed fertility, 1 r. = $1{\cdot}4 \times 10^9 n_{th}/cm.^2$; for chromosome aberration, 1 r. = $1{\cdot}2 \times 10^9 n_{th}/cm.^2$; and for chlorophyll mutation, 1 r. = $2{\cdot}3 \times 10^8 n_{th}/cm.^2$ The relative biological effectiveness of fast neutrons compared with X and γ rays is: for germination rate, 3·5; for seedling growth, 10·0; for seed fertility, 11·8; and for chromosome aberration, 8·0.

3056 *Nezu, M. Relation of ploidy to chromosome aberrations.* (*pp. 140–41*).
Chromosome aberrations induced in polyploid wheats by thermal neutrons were mostly univalents and reciprocal translocations and were more frequent in 6*x* species than in 4*x* ones; the number of chromosome breaks in 6*x* species was three times as high as in 4*x* species. Seed fertility decreased with increase in dosage and was more marked in the 6*x* species. The effects of X and γ rays and fast neutrons were compared. At 2·5 krad. of fast neutrons the number of breaks observed in 4*x* species was 4·47 per cell which was twice as many as the number produced by an X-ray dose of 20 kr. Observation was difficult in the 6*x* species but a figure of 5·62 per cell was arrived at. Both X and γ irradiation at 10 and 20 kr. caused three times as many breakages in the 6*x* species as in the 4*x*. X irradiation of 4*x* and 6*x* species at 10 and 20 kr. induced 1·5 times as many breaks as γ irradiation. There was no difference between 4*x* and 6*x* species with regard to the effects of X and γ rays on fertility.

3057 *Matsumura, S. & Nezu, M. Relation between ploidy and radiation effects.* (*pp. 142–43*).
Triticum monococcum is the most sensitive to thermal and fast neutrons while *T. durum* is most resistant; no significant difference was found between *T. durum* and *T. vulgare*. The 1 r. equivalent effects and the relative biological effectiveness (RBE) of thermal neutrons compared with X and γ rays are calculated for each ploidy level. The RBE values are lower for early stage characters (germination rate, height of 3-week-old seedlings) than for mature plant characters (seed fertility, chromosome aberrations), especially in the polyploids.

3058 *Fujii, T. & Matsumura, S. Radiosensitivity in polyploid plants.* (*p. 143*).
[Cf. XXX, 2386].

3059 *Matsumura, S. & Fujii, T. Radiosensitivity in vegetatively propagated plants.* (*pp. 144–45*).
From experiments with lemon-tree cuttings, strawberry stolons, tulip bulbs and gladiolus corms it was found that the optimum radiation dose for inducing mutation in vegetatively propagated plants is about one tenth of that required for dormant seeds.

3060 *Huang, C.-S. Cytological studies on X-rayed rice.* (*p. 145*).
Studies were undertaken to determine whether there was competition between normal cells and cells with chromosome aberrations in plants grown from seed exposed to irradiation doses of 5, 10, 20, 30 and 40 kr. No competition between cells with translocations and those without was found in the material treated with 5 kr. At 10 and 20 kr. about 8% of cells with translocations were eliminated during successive somatic divisions and about 40% were eliminated at 30 kr. Semisterility and sterility were associated with single and double translocations respectively.

3061 *Takenaka, Y., Ogawa, Y. & Odashiro, T. Effects of extract from Gentiana upon living plant tissue.* (*pp. 149–50*).
An extract from *G. scabra* var. *buergeri* had radiomimetic effects in root-tip cells of *Allium scorodoprasum* var. *viviparum*.

CARMIN, Y.
(Report of the Independent Biological Laboratories for the period between May 1953 and April 1956). Bull. independent biol. Labor. Kefar-Malal, Israel 1956 : **12** : No. 2 : Pp. 14. [Hebrew].
Information is provided on research work being carried out on various field, vegetable and fruit crops.

3062 *Livneh, D.* (*Development of new varieties*). (*pp. 10–12*).
Details are given of the derivation and maturity period of ten wheat varieties developed at Ein Harod and of the performance of a number of sorghum varieties.

3063 *Feldner, H.* (*New varieties of cauliflower developed locally*). (*pp. 13–14*).
Brief descriptions are given of a number of new cauliflower varieties, developed at Beit Alpha as a result of breeding and selection involving Gloria, Early Patna, Early Benares, Erfurt, Metropole and Japanese.

3064 **Eighth Annual Report of the Deir Alla Research Station, The Hashemite Kingdom of Jordan Ministry of Agriculture 1959** : Pp. 89. (Mimeographed).
In addition to the results reported below, varietal trials involving the castor-oil plant, sesame, linseed and safflower are reported.
Cereals. Observations on the yielding capacity of a large number of introduced wheat and barley varieties are reported. A number of crosses were made in the wheat and barley breeding programmes. The rust resistance of 65 wheat varieties was tested at Deir Alla and at Jubeiha; 24 varieties showed no symptoms of the disease. Gabo gave good results in

several wheat varietal trials. In the barley trials, Arivat showed more resistance to lodging than the other varieties tested.

3065 **Appendix to the Eighth Annual Report of the Deir Alla Research Station, The Hashemite Kingdom of Jordan Ministry of Agriculture 1959** : Pp. 25 + 14 + 32 + 12. (Mimeographed).

The results of varietal trials involving sorghum, rice, lucerne, cotton and sugar beet are reported.

3066 Laumont, P. & Chevassus, A. Vues sur les possibilités d'amélioration de la production vivrière en milieu traditionnel et en culture sèche. (**A survey of the possibilities of improving food crop production in the traditional environment and under dry cultivation**). Station Centrale d'Essais de Semences et d'Amélioration des Plantes, Maison-Carrée. Undated : Pp. 7.

The choice of cereal and legume varieties for cultivation in Algeria is discussed.

3067 L'INÉAC au service de l'agriculture Congolaise. (**The National Institute for the Agronomic Study of the Congo in the service of Congolese agriculture**) : 1960 : unpaginated.

A brief, illustrated account is given of the achievements of the above institute in the development of improved crop varieties for the Congo.

3068 **Annual Report of the Department of Agriculture, Uganda Protectorate, for the year ended 31st December, 1959** : Pp. 57.

Maize. KM/58, a synthetic developed by recurrent selection of the local variety Muratha, has yielded well in variety trials and should be useful where early maturity is an important consideration. In breeding for resistance to *Puccinia polysora*, crosses between local maizes and introductions are under investigation.

Coffee. A choice has been made of host varieties suitable for differentiating races of *Hemileia vastatrix*.

3069 **Annual Report of the Department of Agriculture, Tanganyika 1959** (1960) : Pt. II : Pp. 25.

Wheat. Tests on susceptibility to rust were carried out on 519 varieties from the International Wheat Rust Nursery. Only 15 varieties were worth harvesting; two late types showed no rust symptoms.

Cotton. Lines derived from 48/64, 51/77 and 51/111 were markedly superior to 47/10 and IL58 in both yield and ginning outturn [cf. XXX, 191]. The results of district variety trials confirmed that the yielding ability of certain families of Albar hybrids is comparable with that of recent Ukiriguru seed issues.

Cassava. The varieties Kibangiri and Amani 46106/27 showed moderate resistance to mosaic disease.

Coffee. At Kituntu and Maruku, West Lake Province, the varieties K7, KP162, KP432 and H66 were unaffected by *Hemileia* leaf rust; all other varieties tested were attacked. Tallest trees were produced by the drought-resistant SL types, 14, 28 and 34.

Sesame. Selections derived from crosses between the local variety and introductions from Venezuela are undergoing further testing.

Soya bean. A number of newly developed strains are more resistant to lodging and shattering, more suitable for mechanical harvesting and have a higher yielding capacity than Hernon 237.

3070 **Agricultural Research. Union of South Africa Department of Agricultural Technical Services 1960 : 1–3** : Pp. 505.

English or Afrikaans summaries of reports on agricultural research in progress in the Union of South Africa are presented. Crops undergoing breeding include wheat, oats, rye, maize, barley, sorghums, grasses, clovers, lucerne, potato, cotton, tobacco, various fruit crops, cucurbits, tomato and pea, bean and other vegetables.

3071 **Report of the Minister of Agriculture, Province of Ontario, for the year ending March 31, 1960** : Pp. 215.

Work at the Ontario Agricultural College included the following:—

Strawberry. Selections have been made in inbreds for reduced runnering. June-bearing and everbearing inbreds and F_1s of combined inbreds showing a wide range of runnering ability, from none to excessive, have been obtained.

Carrot. F_1 hybrids between inbreds were promising but require further improvement. About 600 hr. below 50° F. were necessary for inducing flowering in lines carrying the heritable character of premature flowering.

Lettuce. *Lactuca sativa* was crossed with several species. The progenies are to be screened for resistance to aster yellows and root rot.

Cucumber. An improved form of the pickling cucumber Hycrop Hybrid is to be introduced. It is highly resistant to mosaic and spot rot but moderately susceptible to bacterial wilt.

Tomato. An F_5 selection of Harrow x Striped Mutant was introduced to the trade as Tanggula. It has been highly rated for external and internal colour and has "concentrated maturity" and resistance to blemish. Besides having fruits with an exceptionally high colour, a "half-wild" cross of Campbell Soup 128 x Philipino 2 has the capacity to set fruit at 45° F., which is 10° below the usual temperature.

3072 **5 years of activities of the Inter-American Institute of Agricultural Sciences of the O.A.S., Turrialba 1954–1959** : Pp. xii + 75 + 7 + 27. (Mimeographed).

The report includes a section summarizing the breeding and other cooperative work carried out on maize, rice, cacao, coffee and other crops in Latin-American countries by the Plant Industry Department of the above organization.

3073 **Director's Annual Reports of the Mexican Agricultural Program, September 1, 1957–August 31, 1958 and September, 1958–August, 1959,** Rockefeller Found., NY : Pp. 406 + 225.

In addition to the work reported below, varietal trials of field, vegetable and fruit crops were conducted in the major agricultural regions of Mexico.

Wheat. High-yielding dwarf varieties, developed by crossing Mexican lines with Japanese dwarfs, are now being recrossed with high-quality Mexican varieties. The development of multiline varieties is being continued; these varieties are made up of a mechanical mixture of a number of phenotypically similar lines which differ genotypically in their resistance to stem rust. The diversity of lines in the variety is designed to provide protection from rust epidemics. The results of a large number of varietal trials are tabulated. Varieties which continue to show resistance to all prevalent races of stem rust are Lerma Rojo [Red Lerma], Gabo 55, Gabo 56, Yaqui 54, Toluca 53 and Chapingo 53. Lerma Rojo, Kentana 54 and Yaktana 54 possess adequate resistance to prevalent races of stripe rust. Among new lines which have performed well in varietal trials are 2229, a selection from the cross Frocor 316 x Frontana-Yaqui, and two lines derived from (Frontana x Kenya 58 - Newthatch) x Norin 10 [Ministry of Agriculture and Forestry 10] - Baart. D255–2c–1R–3M, a durum line derived from Caravaca x (LD357–Capelli), showed considerable promise.

Maize. The results of trials of varieties and hybrids at different altitudes and under various climatic conditions are tabulated. Synthetics suitable for cultivation in specific areas are being developed. The performance of crosses between Mexican and Guatemalan races and three testers, Tuxpeño, Vandeño and Iowa Stiff Stalk Synthetic, indicated that so-called "primitive" races may be very high in combining ability for yield. Mexican tropical lines, which are generally tall and thus susceptible to damage by wind and rain, have been crossed with genetic dwarf types, in an attempt to develop lines with shorter stalks and high yielding capacity. In a trial at Chapingo, H–307 appeared to be immune to corn stunt virus, while H–306, H–301 and VS–101 were highly resistant. The tripsacoid maize races Tuxpeño, Tepecintle, Vandeño and Zapalote chico [Small Zapalote] were also shown to be resistant to the virus. Data are reported on the average infestation of *Laphygma frugiperda* on 50 maize selections. The selections least affected were Gro.169, Gro.115, Cuba 30 and Yuc.15. H–504, a late-maturing white hybrid, has been released for the Veracruz area.

Barley. Data are provided on the relative susceptibility of 42 selections to the corn leaf aphid, *Rhopalosiphum maydis*. Odessa Sel., White, Yuma Mariout and California Mariout are classified as resistant.

Sorghum. A programme designed to clarify the genetic basis of maturity was initiated. In the development of hybrids suitable for local conditions, new lines of potential value are crossed with 3197A, a line possessing cytoplasmic male sterility. A number of tall introductions from India have been selected for use as recurrent parents in a back-crossing programme with SA3002–1, a quadruple dwarf strain. In general, hybrid lines have not performed better than commercial varieties in yield trials, except in the Bajío, where hybrids gave 10–25% higher yields.

Rice. A number of crosses were made during 1958 in an attempt to combine the excellent milling and cooking qualities of Jojutla with the agronomic qualities and disease resistance of several Texan varieties, including Bluebonnet 50 and Century Patna 231. Lines resistant to white-leaf virus have been selected.

Lucerne. Clones of Tanverde, Caliverde and Valenciana are being used in the development of a synthetic resistant to *Therioaphis maculata*.

Varieties least affected by *Pseudopeziza medicaginis* and *Peronospora trifoliorum* at the Santa Elena Station were Caliverde, Valenciana, California Common and Oaxaca. At El Horno, Tanverde, Hojaseo and Oaxaca, as well as a number of introduced varieties, showed some tolerance of root rot (*Fusarium, Phoma* and *Rhizoctonia* spp.).

Potato. Detailed studies on Mexican races of *Phytophthora infestans* are reported [cf. XXIX, 1694, 2804 and 2824]. A number of blight-resistant selections have performed well in yield trials. Operations of the International Cooperative Program in Late Blight Research are described.

Sweet potato. Catemaco and Cuitzeo are described [cf. XXX, 4095].

Pepper. Earliness and improved shape were observed in the F_1 of Chipotle x California Wonder.

Safflower. Gila is reported to be completely resistant to root rot (*Phytophthora* sp.).

Onion. In a varietal trial at La Piedad, Michoacan, White Grano showed high resistance to *Alternaria* sp.

Squash. High-quality native-type lines have been developed as a result of inbreeding and selection.

Tomato. Resistance or tolerance to field infection by *Phytophthora infestans* was shown by 42 out of 139 lines tested near Veracruz. The most resistant line was NH–24–2616–15.

Bean. Jamapa, Antigua and Actopan were released. *Phaseolus coccineus* lines from Chiapas, Oaxaca and Puebla are apparently immune to *Uromyces phaseoli, Colletotrichum lindemuthianum, Erysiphe polygoni, Xanthomonas phaseoli* and *Pseudomonas phaseolicola*. Studies on the genetic relationships between *Ph. vulgaris, Ph. coccineus* and intermediate types continued. At Cotaxtla, 225 plants have been selected for resistance to rust and mosaic virus. At Chapingo, the extent of natural cross pollination in a *Ph. vulgaris* population was found to be approximately 5%.

Year Book of the Carnegie Institution of Washington 1958–1959 : No. 58 : Pp. xi + 500.

3074 *Tisdale, E. W. Intraspecific variation in* Festuca. (*pp. 356–58*).

The initial results of a study of intraspecific variability in *F. idahoensis* are described.

3075 *Clausen, J., Hiesey, W. M. & Nobs, M. A. Evolutionary processes in apomictic species of* Poa. (*pp. 358–60*).

Work on hybrids between apomictic species of *Poa* consisted mainly of analysing the results obtained since the programme was initiated in 1943, this analysis being preparatory to compiling the complete report of the investigations.

3076 *Hershey, A. D., Cocito, C. & Minagawa, T. Growth and inheritance in bacteriophage.* (*pp. 430–31*).

The possibility that phage proteins play a direct role in the stabilization of the structure of the chromosome of T2 has been excluded by experimental evidence.

Isolated T2 DNA consisted of molecules identical in glucose content and chain length. It is possible that the isolation procedures themselves break bonds. If so, the bonds must be weak ones of a special type, holding together nearly identical subunits. It is assumed that the glucose lies in one of the grooves of the DNA helix. Its presence does not introduce any steric hindrance to essential DNA functions.

3077 *Streisinger, G., Mukai, F. & Soon Won Kim. Genetic studies with bacteriophage.* (*pp. 432–33*).

The genetic exclusion occurring in crosses between T2 strains is not due to parental differences in glucosylation of the genome.

By means of the lysozyme system, an attempt is being made to study the relationship between a gene and its protein product.

3078 *Demerec, M.* et al. *Bacterial genetics.* (*pp. 433–39*).

A mutator gene (*mut*) is responsible for high spontaneous mutability in certain strains of *Salmonella typhimurium*. The mutation has increased frequency of mutation of all genes with which it has been tested. It has also induced a change in the fertility factor, which may be either a gene or cytoplasmic component. Fertile strains of *Salmonella* which hybridize readily with Hfr *Escherichia coli* may thus be obtained. Study of the hybrids has shown that the genes controlling synthesis of threonine, leucine, pantothenate, proline and lactose are situated in the same order in *S. typhimurium* and *E. coli*. It has also revealed that three proline loci (*proA, B* and *C*) and the loci associated with glutamic acid and arginine synthesis are close together on the linkage map of *S. typhimurium*. Since these genes control related biochemical reactions, their close linkage constitutes additional evidence of nonrandom distribution of bacterial genes. Similar evidence has been given by three *pan* loci, which proved to be very closely linked and possibly sequentially arranged. In an analysis of reversion of nine alleles at *tryD* induced in

Salmonella by ultraviolet radiation and treatment with 2-aminopurine and 5-bromouracil, a considerable degree of specificity in the response of the different alleles to the three mutagenic agents was detected.

3079 *Kaufmann, B. P., Gay, H., Dutt, M. K., Bal, A. K. & Buchanan, J. The nature of the materials of heredity.* (*pp. 440–49*).
From studies of chromosomes of *Tradescantia* and insects, it has been concluded that deformation by deoxyribonuclease is the result of alteration of the entire nucleoprotein complex. Deoxyribonuclease proved to be an effective mutagen in inducing sex-linked lethals and chromosomal rearrangements in *Drosophila*. Cytochemical analysis indicated that the essential constituents of the "attachment plate" formed by coalescence of the nucleoli in *Tradescantia* microsporocytes are ribonucleoproteins. Electron microscopy has revealed that the early meiotic prophase chromosomes contain the so-called pairing cores or synaptinemal complexes. A combined cytochemical and electron-microscopical study of these chromosomes is being undertaken to evaluate an earlier assumption that RNA plays an essential role in controlling chromosomal form and behaviour. Substances extracted from *Tradescantia* anthers by such agents as phosphate buffer and water are being identified, with a view to elucidating the problem of whether or not a structurally separable chromosomal matrix exists.

3080 *McClintock, B. Genetic and cytological studies of maize.* (*pp. 452–56*).
Further work on changes in phase of *Spm* activity with respect to control of a_2m^{-1} for anthocyanin production [XXX, 1197] provided evidence that each change in phase is associated with an event in some individual cell, which modifies the *Spm* component itself, and that each such event effects a particular type of modification of *Spm*. The type of modification was made evident in the descendent cells by the time and frequency of occurrence of subsequent reversals of phase, the different modifications of *Spm* producing a wide range of effects in respect of reversal. When an inactive *Spm* was carried in a nucleus also containing an active *Spm*, it behaved like an active *Spm*. When, however, its association with the active *Spm* was terminated, it behaved as though it had undergone no permanent alteration. In another test, temporary association of two initially active *Spm* components did not affect their subsequent phase reversal when separated, each retaining its own type of behaviour. Attention is drawn to resemblances in major respects between the *Spm* system and the system governing flagellar-antigen formation in *Salmonella*.
The chromosome constitutions of races of maize from Chile, Bolivia, Ecuador and Venezuela were determined, observations being made chiefly on knobs. All but two of 32 highland races from Chile, Bolivia and Ecuador were remarkably similar in knob constitution. In contrast, many of the lowland races in these countries differed greatly from each other in number, position and size of knob, as well as in degree of heterozygosity for a knob in any one position. Within many of the lowland races, however, the chromosome complement showed a consistent pattern of distribution and type of knob. The knob constitutions of four highland races from Venezuela were markedly different from those of the other Andean races. On the basis of the relationships found between knob constitution and geographical location, it should be possible to trace the origins and migrations of races. Inferences concerning the contribution of hybridization to the development of some of the races may also be drawn from knob constitution. These preliminary studies suggest that present-day maize has been derived from several different centres, past migrations being followed by hybridization.

3081 **Annual Report of the Massachusetts Agricultural Experiment Station 1957–1958** : Bull. 509 : Pp. 68.
Maize. The brachytic-2 gene which shortens the lower internodes in dwarf maize has been introduced into early-maturing inbreds of proven combining ability and superior germ plasm. All possible crosses were made between 10 such inbreds.
Apple. Mention is made of a promising, early, red-fruited variety, Puritan, developed at this station.
Cranberry. With the aim of producing earlier and more palatable fruits, a total of 82 crosses involving Centerville, Voses Pride, Selection #28 and Black Veil were made. A manuscript describing the cranberry varieties of N. America has been prepared.
Cabbage. Attempts are being made to reduce bolting in a recently developed, small, second-early cabbage of the Danish type.
Lettuce. Progress was made in reducing size and increasing uniformity in Waltham Great Lakes.

Tomato. A new second-early hybrid which produces good yields of globe-shaped, firm, crack-free fruits has been developed. Two crack-resistant trellis varieties, Trellis 43 and Trellis 32, were released. Compared with the standard variety Trellis 22, Trellis 43 is earlier, shows 50% less cracking but gives slightly lower yields; not all of the fruits are round but this is receiving attention. Trellis 32 is a late variety, has almost no cracked fruit and produces a high-quality crop in the autumn; its total yield is less than that of Trellis 22.

Sweet corn. Two promising new first-early hybrids are being developed. Good progress was made in incorporating cytoplasmic male sterility and restorer genes into a number of inbred lines.

3082 **Research: gateway to agricultural progress. Seventy-first annual report 1957–1958.**
Bull. Md. agric. Exp. Sta. 1959: No. A–105 : Pp. 80.

Cereals. Breeding for mildew resistance in wheat and barley continued; studies on the inheritance of this character are in progress.

Clover. Clones of Ladino clover selected for resistance to *Sclerotinia trifoliorum*, longevity and productivity are being evaluated in polycross progeny tests.

Tobacco. Breeding for resistance to mosaic, black root rot, wild fire, Granville wilt, anthracnose and aphids continued.

Sweet pepper. Haploid seedlings from seeds with single embryos had the fruit and foliage characters of the male parent. X-irradiation of the pollen in this parent increased the frequency of plants yielding haploids from $< 1\%$ to 5% in one experimental line.

French bean. Plants with pods resembling those of Blue Lake 92 were selected from the progenies of crosses between this variety and 12 commercial dwarf varieties. Of 27 selections only 8 had a flavour similar to that of Blue Lake and it is concluded that no correlation exists which would be of use in selecting for flavour of the Blue Lake type.

3083 **Results of Research in 1959 by the Agricultural Experiment Station of the University of Kentucky. 72nd Annual Report of the Director :** Pp. 86.

In addition to the studies summarized below, varietal trials of field, vegetable and fruit crops are reported.

Maize. The specific combining ability of the inbred lines used in the double-cross hybrids US523W and Ky204 was evaluated. The results indicated that Ky49 limits the yield of US523W, while Ky27 limits its standing ability. The lines involved contribute equally to the performance of Ky204.

A number of experimental white and yellow double-cross hybrids which showed promise in trials at Quicksand are listed.

Festuca arundinacea. Two systems of breeding for improved palatability were tested; the inbred-line method was found to be superior to the maternal-line method. A synthetic formed from five inbred lines was 44% better grazed than Ky31. A number of synthetics and polycross progenies of inbred lines showed higher resistance to diseases than Ky31.

Thirty-three well-grazed progenies of annual ryegrass x tall fescue, which had been back crossed to tall fescue until fertility was stabilized, were inbred in order to study segregation for palatability. Of 33 S_1 lines tested, 14 were significantly better grazed than Ky31.

Lucerne. Plants infected with isolate 190 of the alfalfa mosaic virus were interplanted among 400 seedlings of each of nine lucerne varieties. The percentage of infected plants 21 months later varied from 7% in du Puits and 15% in Atlantic and Narragansett to 31% in Williamsburg.

***Trifolium* spp.** Hybridization of *T. pratense* with 38 other *Trifolium* species was attempted. Fertile amphidiploids were obtained after pollination with *T. diffusum*, an annual, autogamous species. Pollination with *T. hirtum* and *T. pallidum* resulted in some growth of *T. pratense* embryos.

Red and crimson clover plants highly resistant to *Thielaviopsis basicola* have been selected.

Tobacco. A virulent strain of *Pseudomonas tabaci* induced wild-fire symptoms in the normally resistant variety Burley 21. Progress is reported in the development of disease-resistant dark tobacco varieties.

Nicotiana. Species resistant to *Myzus persicae* in the greenhouse continued to show resistance in field tests. Resistant species were found to have a low glucose content, while susceptible species were high in glucose. A number of aphid-resistant species also showed resistance to hornworms (*Protoparce* spp.). Studies on the resistance of wild species of *Nicotiana* to *Phytophthora parasitica* var. *nicotianae* indicated that six species were apparently immune. *N. longiflora* and *N. plumbaginifolia* were susceptible to three virulent strains of the organism. It appears that the most promising sources of resistance are those that have been found in *N. tabacum* itself.

Variations in the content of nitrogen, potassium and total alkaloids in ten Burley varieties are reported. *N. tabacum* haploids ($n = 24$), which are hypersensitive to tobacco mosaic, were crossed with the mosaic-susceptible species *N. sylvestris*. Studies on the reaction of the progeny to the virus suggested that "the H chromosome on which the factor for necrotic spotting is located is not necessary for gamete viability in haploid mother tissue."
Haploids of *N. tabacum* were successfully isolated by means of the twin-embryo and recessive-character techniques. The haploids were nearly pollen sterile (< 1% fertile) but set a small amount of seed when pollinated by diploid tobacco. "Variation of pollen fertility in the F_1 haploid x diploid plants (0–95%) suggested that the gametes were of meiotic origin and not functional restitution nuclei *per se*. Meiotic observations on the haploid have suggested a high incidence of univalents that divided equationally at MI, since diad pairs with a combined total of approximately 38 to 44 chromosomes were observed."
Strawberry. Midway was released [cf. XXX, 4294].
Tomato. Selected F_6 lines were screened for resistance to *Fusarium* wilt; 36 resistant plants with outstanding horticultural features were selected for further testing.
Soya bean. Perry, Ogden and Lee showed resistance to attack by the mite *Tetranychus telarius*.
Sweet corn. The response of 20 hybrid varieties to the corn earworm (*Heliothis obsoleta*) was investigated at Princeton and Lexington. South Chief, Goldtwin and Golden Regent were relatively resistant, while Goldenyield, Golden Sensation, Golden Jewel, Valleygold and Staygold were "somewhat less resistant."

3084 Pimentel, H. & Baldanzi, G.
Contribuições recentes da estação experimental de Curitiba à agricultura paranaense. **(Recent contributions of the Curitiba Experimental Station to the agriculture of Paraná).**
Circ. Inst. agron. do Sul 1960 : No. 9 : Pp. 34.

Varietal trials have been made with oats, rye, barley, French beans, potatoes and cassava.
Wheat. A number of crosses have been made with the variety Trintani, one series with the object of reducing its straw yield and increasing its earliness, another to improve its disease resistance. Three selections have all surpassed the popular wheat Frontana in yield.

3085 Departement van Landbouw, Veeteelt en Visserij in 1958. **(Department of Agriculture, Stock and Fisheries in 1958).**
Surinaam. Landb. 1960 : **8** : 25–93.

Rice. Surinam varieties are not among those most susceptible to hoja blanca [white leaf], and the variety Holland even shows good resistance.
Pulses. X irradiation of the soya beans Laris [In Demand] and Vada has given rise to lines exceeding the initial varieties in yield. Progenies from irradiated seed of the groundnut Matjan [Tiger] and *Phaseolus radiatus* 'Jumbo mung 710' have shown promise.

3086 **Annual Report of the Department of Agriculture and Stock, Queensland for the year 1959–60** (1960) : Pp. 126.

In addition to the results summarized below, varietal trials of maize, cotton, sorghum and other crops are reported.
Wheat. Two new virulent races of stem rust have appeared. One of the races, 34–3, overcame the resistance of Gabo and *Triticum timopheevi*. The other was similar to 21–2 but was able to attack adult plants of Spica. Hopps, Kenora, Lawrence and Festival continue to show satisfactory resistance.
Sorghum. Hybrid lines gave higher grain yields than the standard varieties Alpha and Early Kalo.
Tobacco. Some progress was made in the selection of lines resistant to *Peronospora*.
Tomato. A hybrid derived from Q2 x Salads Special performed well in a trial at Redlands Experiment Station.
Bean. Redlands Beauty and Redlands Belle [cf. XXX, 210] may be superseded by 1212, an agronomically superior variety with effective resistance to angular leaf spot (*Isariopsis griseola*).
Pea. Selections derived from Massey x Canner 75 are now undergoing regional testing.

3087 Elandt, R.
Biometric methods in plant breeding.
Acta agron., Budapest 1960 : **10** : No. 1–2 : 69–74.

The first section of this brief review deals with the selection of individual plants, consideration being given in turn to: (*a*) rules for selection for a continuously varying character y; (*b*) the gain in y due to selection; (*c*) the chief properties of the distribution of y after selection; and (*d*) the construction of selection indices. The second part, concerned with comparative trials, discusses (1) the selection of new varieties, (2)

the comparison of the selected varieties with the standard and (3) methods of estimating the probability density function.

3088 Didus', V. I.
(The eminent Soviet scientist and plant breeder Academician Vasilij Jakovlevič Jur'ev).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 3–7. [Russian].
The breeding of wheat, oats, rye, maize, barley, *Phaseolus* and other crop plants by Jur'ev at the Ukrainian Institute of Plant Industry, Breeding and Genetics during the fifty years since the institute was founded is surveyed.

3089 Cikov, D.
[Academician Dončo Kostov (1897–1949)].
Selskostopan. Misăl 1959 : No. 10 : 796–98. [Bulgarian].
This biography gives an outline of Kostov's scientific work, including the breeding of useful varieties of wheat, tobacco and other plants.

3090 Fesenko, N. V.
(A plant-breeding balance).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : p. 67. [Russian].
The device described consists of a glass container into which a given weight of grain is placed, a vibrator which causes the grains to reach maximum compactness in 2 min., and a graduated scale on which the hectolitre weight is read directly.

Atti del 6° convegno annuale della Società Italiana di Genetica Agraria (Forlì-Castrocaro, 4–6 ottobre 1959). **[Proceedings of the 6th annual meeting of the Italian Society for Agricultural Genetics (Forlì-Castrocaro, 4–6 October 1959)].**
Genet. agr. 1960 : **12** : 201–396.
The meeting was devoted to the use of mutations induced by physical and chemical agents in plant breeding.

3091 *Mac Key, J. Radiogenetics in* Triticum. (*pp.* 201–30).
Topics discussed in this review include the relationship between ploidy level and radiosensitivity, the influence of ploidy level on the mechanism of mutation and the relevance of radiogenetic studies to phylogenetic and evolutionary problems.

3092 *Avanzi, S., D'Amato, F., Donini, B. & Scarascia, G. T. Impiego di radiazioni ionizzanti nel miglioramento genetico di grani italiani. (The use of ionizing radiations in the genetic improvement of Italian wheats). (pp. 231–50).*
Further data [cf. XXX, 3786] presented concerning the progenies of the wheats 'Brescia' and 'Cappelli', treated with X rays and with thermal neutrons, confirm the greater efficacy of neutron treatments in producing mutations. A greater proportion of mutants was obtained in mass sowings than in the progenies of single ears.
Several of the R_2 mutants bred true in the R_3 but others segregated, many of the segregating progenies having a deficiency of recessives. Several progenies that bred true to normal type in the R_2 gave segregations in the R_3.

3093 *Scossiroli, R. E., Palenzona, D. & Rusmini, B. Influenza su caratteri morfologici nel frumento di trattamenti con raggi X applicati al seme. (Influence of treatments with X rays applied to the seeds on morphological characters in wheat). (pp. 251–82).*
Grains of *Triticum durum* 'Cappelli' and *T. vulgare* 'Damiano' and 'Mara' were subjected to doses of 10×10^3 r. and 20×10^3 r., untreated grain from the same ear serving in each case as control. The higher of the two doses proved too high. Effects of the treatment included reduction in root development, length of coleoptile, length and number of internodes and number of tillers; rachis length was reduced in Damiano and Mara and number of grains per ear and per spikelet was reduced in all three cultivars. Irradiated progenies showed greater variation in such features as plant height, and length of the top 3 internodes and less variation in tiller number.

3094 *Nilan, R. A. Factors that govern the response of plant tissues to ionizing radiation. (pp. 283–96).*
Studies on the influence of temperature, moisture and other factors on the radiosensitivity of barley and other crops are reviewed.

3095 *Gaul, H. Critical analysis of the methods for determining the mutation frequency after seed treatment with mutagens. (pp. 297–318).*
The relative accuracy of four methods of measuring mutation frequency is discussed. Measuring the number of mutations per 100 M_2

plants is considered to be superior to measuring the number of mutations per 100 M_1 plants, per 100 M_1 spikes, or per 100 M_1 "inflorescence sectors." Errors involved in each of the four methods are critically discussed with reference to four X-irradiation studies on barley.

3096 *Hagberg, A. Cytogenetic analysis of induced mutations.* (*pp. 319–36*).

Dealing with the cytogenetics of *erectoides* mutants in barley, this paper is virtually the same as one referred to previously [149].

3097 *Bianchi, A. Le traslocazioni fra cromosomi A e cromosomi B nel mais: loro uso per lo studio della mutabilità.* (*Translocations between A and B chromosomes in maize: their use for the study of mutability*). (*pp. 337–54*).

The main literature dealing with B chromosomes is reviewed, special mention being made of work by Roman and others on A–B translocations [XXII, 351]. It is pointed out that translocations possessing certain easily detected genes in the simplex condition would be useful in studies on the nature of mutations induced by irradiation.

3098 *Donà dalle Rose, A. Aberrazioni cromosomiche ed anomalie somatiche da radiazioni ionizzanti su glomeruli di barbabietola da zucchero.* (*Chromosome aberrations and somatic anomalies from ionizing radiations on sugar-beet glomerules*). (*pp. 355–63*).

Glomerules of the diploid sugar beet 359 exposed in the dry state to radiations from Co^{60} at doses corresponding to 60,000 and 120,000 rad were reduced in germination capacity and gave rise to seedlings showing considerable anomalies, most of those from the higher dosage being inviable. Root tips 4–5 mm. long from germinating seedlings were therefore irradiated with the same doses. Various mitotic irregularities resulted and are illustrated. Control seedlings examined at the same stage showed no anomalies. Most of the seedlings from the lower dosage survived whereas all those from the higher succumbed after 3–4 weeks.

3099 *Ehrenberg, L. Induced mutation in plants: mechanisms and principles.* (*pp. 364–89*).

Investigations on the mode of action of various mutagenic agents, and on factors influencing their effectiveness, are reviewed. The practical consequences of the results obtained from these studies are discussed. For applied mutagenesis work on new plant material, the following programme is recommended: (1) a study of the genetic effects induced by ionizing radiations, including γ or X rays and neutrons, and the establishment of methods for measuring mutation rates in the progeny; and (2) the application of chemical mutagens as a means of increasing the variation in desired characteristics.

3100 Britten, E. J.
A proposed classification of screening methods for plant breeding programs.
Euphytica, Wageningen 1960 : **9** : 293–303.

The importance of screening methods in plant breeding is discussed and the following classification scheme is outlined, various procedures under each heading being described: (1) direct identification of desirable and undesirable plants, (2) methods based on comparisons of length, weight or other physical characters; (3) methods involving chemical determinations; (4) indirect procedures involving biological assay; and (5) combined methods, such as baking tests for quality in wheat. The desirability of using reliable tests which can be applied at the seedling stage is stressed.

3101 Belenovskij, V. N.
(Seed production on collective and state farms in the Kujbyšev province during the seven-year plan).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 18–21. [Russian].

Recently introduced high-yielding crop varieties are mentioned and include some wheats with strong flour and the sunflower VNIIMK 8883 [Oil Plants Institute 8883], which has a high oil content.

3102 Nilsson-Leissner, G.
Nya sorter. **(New varieties).**
Försök o. Forskn. 1960 : **17** : p. 68.

The following varieties have received state certification or the designation "original". The Weibull original wheat Trond has already been described [295]. The red clover Hinderupgaard III has proved the most productive early strain in southern Sweden, in both first and second cuts. Intended to replace Viktorin, the Svalöf original swede Odal gives improved yields of dry matter and is also suitable for human consumption. The Weibull original celeriac Tellus, developed from the German variety Apfel [Apple], gives very high yields. Gomé, a new state-certified dried-pea variety developed

at Hammenhög from Golderbse [Golden pea] x Torsdags III [Thursday III], yields well, is as early as Stråt [Ray] and appears to be good in cooking quality.

3103 Laumont, P.
Résultats obtenus à la Station Centrale d'Amélioration des Plantes de Grande Culture de Maison-Carrée. (**Results obtained at the Central Station for the Improvement of Field Crops at Maison-Carrée**).
Alger undated : Pp. 11.
Information is provided on a large number of field crop varieties, bred at the Maison-Carrée Station in Algeria.

3104 Miège, T.
Nombres chromosomiques de plantes d'Afrique Occidentale. (**Chromosome numbers of plants of West Africa**).
Rev. Cytol. Biol. végét. 1960 : **21** : 373–84.
The following chromosome numbers are among those reported: *Cassia mimosoides* and *C. nigricans*, $2n = 16$; *Crotalaria barkae*, *C. glaucoides*, *C. podocarpa*, *C. senegalensis* and *C. sphaerocarpa*, all $2n = 16$; *Desmodium gangeticum*, *D. lasiocarpum* (= *D. velutinum*) and *D. salicifolium*, all $2n = 22$; *Euphorbia balsamifera* and *E. tirucalli*, $2n = 20$; and *Phaseolus scaberulus*, $2n = 22$.

3105 Sharma, A. K. & Bhattacharyya, N. K.
Cytology of several members of Zingiberaceae and a study of the inconstancy of their chromosome complements.
Cellule 1959 : **59** : 297–357.
Data on chromosome number and caryotype are given for 26 species pertaining to ten genera of the Zingiberaceae. Polyploidy and aneuploidy appear to have played a part in speciation, as do also structural chromosome changes, every species having a distinct caryotype. Wide variations in chromosome number are found within somatic tissues, and since vegetative reproduction takes place in all these species, it is considered that the numerous chromosomal biotypes found in almost all the genera have arisen through propagation of somatic mutations by this means. The relatively long chromosomes of *Costus*, *Zingiber* and *Kaempferia* are regarded as representing a rather primitive condition.
Ravenala madagascariensis, normally included in the Strelitziaceae, resembles *Musa* in chromosome number and chromosome morphology and may represent a bridge between the Strelitziaceae and the Musaceae.

3106 Hagberg, A.
Der Effekt von Mischung und Kreuzung mit diploiden auf polyploide Populationen und andere Erfahrungen der Polyploidiezüchtung in Svalöf. (**The effect of mixing and crossing with diploids upon tetraploid populations, and other experiences of polyploidy breeding at Svalöf**).
Tagungsber. dtsch. Akad. Landwirtschaftsw. Berlin 1957 (1958) : No. 18 : 31–34.
[Cf. 223].

3107 Lenkov, L.
(**Postharvest maturation of some cereal crops and sunflower**).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 7 : 30–33. [Bulgarian].
Information is provided on varietal differences in postharvest maturation of five oat, seven rye, fourteen maize and nine sunflower varieties, all of which were grown in the Sofia province in 1957.

3108 Kraai, A.
Bijen en hommels als hulp bij de bestuiving op de selectiebedrijven. (**Honey bees and bumble bees as an aid to pollination in breeding establishments**).
Zaadbelangen 1961 : **15** : 22–24.
For the selfing or crossing of a few plants in small isolation chambers, either individually caught bumble-bee queens or miniature hives of honey bees may be used. The construction and management of the miniature hives, which may also be used for the pollination of large groups of plants in larger chambers or warm greenhouses, are outlined. Higher seed yields have been obtained by these means than in the field.

3109 Sarvella, P., Meyer, J. R. & Owings, A.
A Scotch tape method for counting or measuring stomata.
Crop Sci. 1961 : **1** : 81–82.
A rapid method of screening seedlings for haploids or polyploids consists in obtaining stomatal imprints on Scotch tape. The imprints last for about a week and the method is applicable to any plant with glabrous leaves.

3110 Jánossy, A.
Kultúrnövények fajtagyüjteményének fenntartása és vizsgálati módszerei. (**The collection and maintenance of varieties of cultivated plants and the methods of study employed**).
KisérlÜgy. Közl. 1959 : **52A** : 3–25.
The establishment and organization of the world collection of varieties of field crops, pasture crops and fruits at Tápiószele, Hungary, since its initiation in 1954 are described. The work includes collection, maintenance and testing of local and introduced varieties on different soils.

3111 Olthoff, B. H.
Plantenveredeling en plantenteelt in verband met mechanisatie. (**Plant breeding and crop production in connexion with mechanization**).
Jaarb. algem. Bond Oud-leerl. Inricht. Middelbaar LandbOnderwijs., Wageningen 1960 : 39–42.
Plant characters required for mechanical harvesting are listed for cereals, beet, potato, pulses, such seed crops as rape, caraway, mustard and poppy, flax, turnip and grasses for seed production.

3112 De Wit, C. T.
On competition.
Versl. landbouwkund. Onderzoek 1960 : No. 66.8 : Pp. 82.
The following topics are discussed, models and formulae being given where appropriate: relative reproductive rate in a mixture in which neither component affects the other; the analogy of plant mixtures with binary mixtures of liquids; crowding for the same space in plant mixtures of two components; crowding between healthy and diseased plants; the relation between spacing and competition experiments; population growth and competition; crowding effects in mixtures of more than two species; competition as affected by active processes in one component, e.g. nitrogen fixation or production of toxic substances; and competition between perennial grassland species.

Proceedings of the IVth International Congress of Crop Protection, Hamburg, September 1957.
1959 : **1** : Pp. xii + 1048.

3113 *Stakman, E. C. Progress and problems in the development of disease-resistant varieties of crop plants.* (*pp. 5–14*).
Modern developments in the breeding of wilt-resistant flax, *Fusarium*-resistant vegetables and rust-resistant cereals are among the topics discussed. The need for further efforts to acquire basic and applied information on the genetics, physiology and ecology of crop plants and their pathogens is emphasized.

3114 *Shaw, M. Studies on the physiology of the host-parasite relations of wheat stem rust.* (*pp. 75–80*).
Significant changes in nitrogen metabolism, respiration and auxin activity were found to occur in seedling leaves of rust-infected wheat plants. Successful development of the pathogen "may involve the regulation, possibly by a hormonal mechanism or mechanisms of the respiratory pathway and protein synthesis or growth in the host."

3115 *Forsyth, F. R. Studies on the physiology of resistance to cereal rusts.* (*pp. 89–90*).
Maleic hydrazide, DDT and other chemical substances were shown to be capable of partially destroying the rust resistance of Khapli, a *Triticum dicoccum* variety normally resistant to 227 out of 231 races of stem rust. Certain changes in DDT-treated plants are outlined. The chemical and genetic bases of rust resistance are discussed briefly.

3116 *Suchorukov, K. T. Faktoren von passiver und aktiver Bedeutung in der Immunität von Pflanzen.* (*Factors of passive and active importance in the immunity of plants*). (*pp. 91–95*).
This review deals mainly with studies of the role of physiologically active substances such as vitamins and antitoxins in determining susceptibility or resistance to disease.

3117 *Hassebrauk, K. & Kaul, R. Zum Problem der physiologischen Resistenz gegen Weizenbraunrost.* (*On the problem of the physiological resistance to brown rust of wheat*). (*pp. 99–97*).
It is thought that the degree of infection is determined by the supply of nutrients in the host but other factors determine whether the plant is susceptible or resistant. Mention is made of experiments showing that variation in environmental conditions may affect the content of phenolic substances and ascorbic acid and also the resistance to rust.

3118 *Fuchs, W. H. Weitere Beiträge zur pathologischen Physiologie der Pflanze.* (*Further contributions to the pathological physiology of the plant*). (*pp. 101–04*).
Problems concerning physiological resistance to disease are discussed.

3119 *Müller, K. O. Über den Wirkungsmechanismus nekrogener Abwehrreaktionen ("Überempfindlichkeits"-Reaktionen).* [*The mechanism of the action of necrogenic defence reactions (hypersensitivity reactions)*]. (*pp. 105–07*).

Hypersensitivity reactions are discussed with reference to studies of the resistance of *Phaseolus* to various pathogenic fungi; the reaction in this case involves the release after infection of a substance inhibiting further development of the pathogen. This type of mechanism seems to be a general phenomenon.

3120 *Rădulescu, E. Die Änderung der Steinbrand- und Flugbrandresistenz des Weizens in Abhängigkeit vom Ernten des Saatgutes in verschiedenen Reifephasen.* (*Alteration of the resistance of wheat to bunt and loose smut in relation to the harvesting of the seed in different stages of ripeness*). (*pp. 109–13*).

With regard to bunt resistance, the varieties investigated fell into three groups: (*a*) varieties which showed a severe attack when harvested in the yellow stage and a less severe attack in the milky and fully ripe stages; (*b*) varieties in which the severity of the attack increased from the first to the last stage of ripening and (*c*) varieties in which the attack decreased from the milky stage to complete ripeness. On winter wheat the attack by loose smut was lower the earlier harvesting took place. On a spring wheat the greatest attack by loose smut occurred during the yellow stage and the least in the milky stage, the fully ripe grain also showing only a slight attack.

3121 *Batts, C. C. V. Some aspects of infection of loose smut* (Ustilago tritici) *in susceptible and resistant varieties of wheat*). (*pp. 115–16*).

A group of 57 wheat varieties are classified into six groups on the basis of differences in field reaction and embryo susceptibility to races C2 and C3 of *U. tritici*.

3122 *Vasudeva, R. S., Bajaj, B. S., Iyengar, M. R. S., Chatrath, M. S. & Ganju, P. L. Mutagenic and stimulative effects of ionizing radiations on certain micro-organisms.* (*pp. 121–23*).

Biochemical variants of *Colletotrichum falcatum* (*Physalospora tucumanensis*), induced by exposure to P^{32}, are described and classified. Descriptions are also given of P^{32}-induced cultural variants of *Phycomyces blakesleeanus*.

3123 *Guyot, L. & Massenot, M. État actuel du problème de l'épidémiologie de la rouille noire du blé* (Puccinia graminis tritici) *en Europe et en Afrique du Nord.* [*The present stage of the problem of wheat rust* (P. graminis tritici) *epidemiology in Europe and North Africa*]. (*pp. 125–28*).

A number of physiological races of *P. graminis* var. *tritici* are divided into groups A, B and C on the basis of their distribution in Europe and North Africa. The eight races belonging to group A are most frequently responsible for widespread rust attacks. Information is provided on the alternate host species on which the sporulation of various races has been observed. The role of *Berberis* in the differentiation of new physiological races is briefly mentioned.

3124 *Santiago, J. C. International cooperation, the best tool to fight wheat stem rust in Europe.* (*pp. 129–31*).

A world collection of 1200 wheat varieties at Elvas, Portugal, was screened for rust resistance. Approximately 25 varieties were immune or highly resistant to all the races used, 14, 16, 21, 40, 116, 176 and 186. Information is provided on the most prevalent races of the pathogen in Portugal, Spain, France and other European countries. The need for international programmes to combat the disease is emphasized.

3125 *Zakopal, J. Gibt es in der Tschechoslowakei Biotypen des Kartoffelkrebses?* (*Are there biotypes of potato wart in Czechoslovakia?*) (*pp. 139–40*).

[Cf. XXIX, 4066].

3126 *Granhall, I. Aktuelle Probleme der Resistenzzüchtung in Schweden.* (*Present problems of resistance breeding in Sweden*). (*pp. 141–43*).

Breeding for resistance to rusts in cereals, nematodes in red clover and scab in apples is discussed.

3127 *Fedotova, T. J. Conditions for the development and preservation of disease resistance in hybrids and varieties.* (*pp. 165–68*).

Studies in the Soviet Union on *Puccinia triticina*, *Synchytrium endobioticum*, *Phytophthora infestans* and other plant pathogens have indicated that the joint cultivation of old and new

varieties is one of the factors tending to promote adaptive variation and specialization of these pathogens. Geographical, edaphic and genetic factors influencing physiological changes in pathogenic fungi, and their relevance to the breeding of disease-resistant crop varieties, are also discussed.

3128 *Dunin, M. S. On some methods of obtaining and applying antisera in phytopathological and entomological researches.* (*pp. 259–66*).

The use of serological methods in the selection of disease-resistant crop varieties is among the topics discussed.

3129 *Kreitlow, K. W. A technique for screening white clover for virus resistance.* (*pp. 355–57*).

As a result of studies at the Plant Industry Station, Beltsville, Md., the following method of screening white clover for resistance to the bean yellow mosaic and lucerne mosaic viruses is suggested: (1) virus inoculum is applied to the cotyledons of clover seedlings, 7–10 days after sowing; (2) the seedlings are incubated for 10–15 days; (3) bean leaves are inoculated with leaf extract obtained from the clover seedlings. Symptoms of lucerne mosaic should appear on the bean leaves within 2–3 days while symptoms of bean yellow mosaic develop in 7–14 days.

3130 *Vuittenez, A. Inoculation de différentes espèces de* Vitis *par les virus du groupe de la dégénérescence infectieuse. Application au diagnostic de la maladie.* (*Inoculation of different* Vitis *species by viruses of the infectious degeneration group; application to disease diagnosis*). (*pp. 361–66*).

The reaction of 22 *Vitis* species and hybrids to degenerative viruses was investigated. Wide variations in the severity of internal and external symptoms were observed. Among the lines which showed relatively mild symptoms were *V. labrusca, V. sinensis* and *V. amurensis*. Particularly acute symptoms were noted in *V. rupestris* and *V. vulpina*; these species may be useful in the indexing of degenerative viruses.

3131 *Jones, F. G. W. Resistance-breaking biotypes of potato root eelworm.* (*pp. 591–94*).

Studies on aggressive biotypes of *Heterodera rostochiensis* are reviewed [cf. XXVII, 4164 and XXVIII, 4411]. The significance of these biotypes in the breeding of eelworm-resistant potato varieties is discussed.

3132 *Buhr, H. Vergleichende Untersuchungen über die Resistenz einiger Solanaceen genenüber* Leptinotarsa decemlineata *Say*, Epilachna vigintioctomaculata *Motsch. und* Epilachna vigintioctopunctata *Fabr.* (*Comparative investigations on the resistance of some Solanaceae to* L. decemlineata *Say*, E. vigintioctomaculata *Motsch. and* E. vigintioctopunctata *Fabr.*). (*pp. 707–14*).

Observations on the behaviour of larvae of these insects on various plants, including species of *Nicotiana* and *Solanum*, are reported. Nicotine and capsaicin, when present in sufficient concentration, conferred resistance to all three insects. Of the wild potatoes tested, only strains of *S. polyadenium* were resistant to both *Leptinotarsa* and *Epilachna*. It appeared that some of the chemical substances in *Solanum* species conferring resistance to *Leptinotarsa* had no effect on *Epilachna*.

3133 *Becker, H. Untersuchungen über den Befall von Unterlagsreben durch die Reblaus.* (*Investigations on the attack of rootstock vines by* Phylloxera). (*pp. 783–85*).

In resistant rootstocks the tumours caused by *Phylloxera* on old roots are completely sealed off by means of periderm. If a piece of infected root is cut from the plant and examined with a magnifying glass, it is possible to see whether the tumour has been sealed off. This provides a simple method of recognizing resistant seedlings. The formation of nodosities on root tips is of no significance if older parts of the root system remain free of attack.

3134 Dorst, J. C.
Sources of resistance.
Euphytica, Wageningen 1960 : **9** : 265–71.

This is an English version of a paper already abstracted from the Dutch [XXX, 2415].

3135 Rubin, B. A.
(Biochemical bases of immunity in plants).
Agrobiologija (Agrobiology) 1959 : No. 6 : 894–907. [Russian].

Higher activity of polyphenoloxidase was observed in infected tubers of the *Phytophthora*-resistant potato Moscow than in the susceptible Early Rose at the Bah Institute. Differences were also observed in peroxidase activity following infection with *Botrytis* between the cabbages Amager and Moskovskaja Pozdnjaja

[Moscow Late], the former resistant and the latter susceptible to *Botrytis* storage rot; the peroxidase activity in the resistant variety was higher.

3136 VAN DOBBEN, W. H.
De invloed van de daglengte op overwinterende gewassen. (**The influence of day length on overwintering crops**).
Jaarboek 1960 : Med. Inst. biol. scheikund. Onderz. LandbGewass., Wageningen 1960 : 85–96.

The data given on rye, barley and wheat have already been reported elsewhere [cf. 245]. In addition, it is noted that a wild red clover and a bred variety both had a critical day length of 14–15 hr. at summer temperatures and less than 12 hr. at winter temperatures. Under natural conditions, photoperiodic induction appears to be complete by mid-March in the wild strain and by mid-April in the bred strain.

CEREALS

3137 **Cereal variety trials, 1960.**
Agric. N. Ire. 1961 : **35** : 301–04.

Oats. Condor, which gave consistently good yields under the very dry conditions of 1959, repeated its performance under the very wet conditions of 1960. Marino gave almost as good yields as Condor but was inferior to it in grain quality. Stormont Sceptre gave slightly higher yields than Sun II and Palu. Observations on lodging resistance indicated that Palu, Angus, Condor and Marino were a little more resistant than Sun II and Stormont Sceptre.

Barley. Pallas gave good yields under a wide range of fertility and weather conditions. Yields slightly below that of Pallas were given by Ingrid, Delta, Domen and Bonus; Early 8 gave the lowest yield. Domen and Early 8 showed considerable intersite variability. High resistance to lodging was shown by Domen and Early 8 followed closely by Delta. Pallas and Ingrid were slightly less resistant than Delta while Bonus was distinctly inferior.

3138 MÜLLER, K.-H.
Ergebnisse mehrjähriger Wintergetreide-Sortenversuche. (**Results of several years' winter-cereal varietal trials**).
Z. landw. Vers.- UntersuchWes. 1960 : **6** : 322–52.

The results of trials of wheat, rye and barley in the German Democratic Republic are reported in detail.

3139 NAZARENKO, K.
(**Best varieties on to the fields of the collective and state farms**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1959 : No. 12 : 40–41. [Russian].

Improved hard and soft wheat standards, which have already been described, are being introduced in the Soviet Union. High-yielding standards of maize hybrids are also listed. All are double crosses or top crosses bred in the Soviet Union, except Pioneer 338A originating from the USA. New hybrids now under trial include those to which cytoplasmic male sterility has been imparted at the Kuban' research station of the Institute of Plant Industry.

3140 ELIASSON, S. & AGERBERG, L. S.
Sortförsök med vårstråsäd på organogena jordar i södra och mellersta Sverige. (**Varietal trials of spring cereals on organic soils in southern and central Sweden**).
Medd. Jordbruksförs. 1960 : No. 115 : Pp. 47.

Details of yield, grain quality, earliness and straw strength are given for varieties of spring wheat, barley and oats tested during 1941–59.

3141 Beretning om Pajbjergfondens Kornforædlingsvirksomhed 1959. (**Report on the cereal breeding work of the Pajbjerg Foundation, 1959**).
Pp. 17. (Mimeographed).

Wheat. In addition to Eroica x Konge [King] 69/28 [cf. XXX, 106], the very winter hardy combinations Eroica x Konge 161/17, Eroica x Konge 23/17 and Æring x Konge 57/5–17 are mentioned as being of interest. Lines from further crosses made with a view to improving hardiness are also under study. A mixture of wheat-like lines from wheat x rye crosses has yielded well, and there is evidence that this material is less readily attacked by foot-rot diseases than ordinary wheat.

Oats. Besides Marne x Minor 52/4–13 [cf. XXX, 166], the following varieties, all stiffer strawed than Rex, have shown promise: P150 x Marne 11/12, which is 1–2 days later than Rex; Ørn [Eagle] x Minor 1, which is 3–4 days earlier than Rex; and Marne x P58, which ripens at the same time as Rex but has shorter straw. Material almost entirely free from cysts when tested for eelworm resistance has been found in crosses involving Grise de Houdan [Houdan Grey]. Eelworm-resistant *Avena sterilis* has been crossed with P150 x Marne 11/12.

Rye. Selection for short stiff straw was carried

out in inbred lines and these were then combined in groups of 2–5. The various progenies obtained have short or very short straw, resist lodging and, in a single trial, have compared favourably in yield with Kungs [King's].

Barley. The work referred to in the last report continued [cf. XXX, 166]. Plants resistant to one oat-nematode race have been found among populations from Juli x Rigel crossed with Drost [Seneschal] and from crosses of Drost with Rika.

3142 Vestergaard, E.
Abed Planteavlsstation. (**Abed Plant Breeding Station**).
Beretn. Planteavl. Loll.-Falster. 1960 : 5–12.

Wheat. Abed 84 and Abed 85, both bred from Weihenstephan I, have good mildew resistance and stiff straw and have shown promise in yield trials. Abed 83 and Abed 87, of the same origin, have also shown promise.

Barley. Halle 4592/51, which in Hungary shows good disease resistance, seems to be more resistant to rust than mildew under Danish conditions. Under severe mildew attack, the following figures for resistance were obtained in spring barleys (10 = immune, 0 = completely susceptible): Heine 4808, 10; Minerva, 9; and *Hordeum laevigatum*, 8. A population from *H. laevigatum* shows evidence of combined resistance to rust and mildew. Lines from Carlsberg II x Strengs Franken III appear to combine the low protein content and high extract yield of Carlsberg II with the mildew resistance of Strengs Franken III. Lines from 3173 show promise in grain yield and straw stiffness.

3143 Mudra, A.
Getreidezüchtung in Iran. (**Cereal breeding in Iran**).
Z. Pflanzenz. 1960 : **44** : 279–300.

An outline is given of past breeding and future plans; descriptions of species and varieties occurring in Iran and the breeding procedures used are included.

3144 Obolensky, G.
Getreidekultur und Klima. I. Kanada (Quebec, Ontario, Manitoba, Saskatchewan). II. Kanada (Alberta, British Columbia, Yukon, Nordwest Territories). [**Cereal cultivation and climate. I. Canada (Quebec, Ontario, Manitoba, Saskatchewan). II. Canada (Alberta, British Columbia, Yukon, North West Territories)**].
Qual. Plant. Mater. veg. 1960 : **7** : 297–323.

Cereal breeding and production in Canada are briefly surveyed.

3145 Schafer, J. F. *et al.*
Small grain varieties for Indiana. Characteristics, performance, 1956–60, and recommendations for 1961.
Res. Bull. Purdue Univ. 1961 : No. 716: Pp. 16.

A detailed report is given on variety trials of wheat, oats and barley.

3146 Avanzi, E.
Mario Bonvicini.
Europ. Potato J. 1961 : **4** : p. 1.

The contributions of the late Dr. M. Bonvicini (1899–1960) to cereal and potato breeding are briefly described.

3147 Aksel, R. & Muntjewerff, N.
A note on a group isolator for hybridization of wheat and barley.
Canad. J. Genet. Cyt. 1961 : **3** : 87–88.

Use of the device described eliminates the necessity for hand pollination of single florets. The apparatus consists of (1) a cylindrical cage of galvanized wire, (2) a water container (glass beaker or ordinary paper cup) attached to the inner part of the cage, (3) an iron support to which the cage is attached by means of a sliding perforated sleeve so that the height of the cage above the ground may be adjusted, and (4) a cage cover of pollen-tight muslin. The isolator accommodates 20–30 emasculated ears. The tips of the emasculated florets should be clipped to facilitate pollination. Twenty-four hours after emasculation, 10–20 ears of the ♂ parent are placed in the water container. Seed-setting percentage varies according to the cross.

3148 Cicin, N. V.
(Ch. Darwin and some problems of biology).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1959 : No. 6 : 832–38. [Russian].

Darwinism is discussed in relation to Mičurinism and distant hybridization, and experiments by Cicin and his colleagues on crossing wheat, rye and barley with *Agropyron* and *Elymus* spp. are described. The details of this work are essentially the same as published in earlier reports [cf. XXX, 1292]. The following supplementary observations are made. Cytological study of *E. arenarius* showed that all plants were octoploids with $2n = 56$, while *E. giganteus* comprised two caryological races, a tetraploid with 28 chromosomes and an octoploid with 56. Reference is made to the different behaviour of the races in crosses with cultivated plants. A high proportion of polyploids occurred among the distant hybrids most dissimilar to the wild

parental species. Hybrids of interest to the plant breeder include a *Hordeum-Elymus* form with 21 chromosomes, a *Triticum-Elymus* form with 49, *Triticum-Agropyron* forms with 56 and 84 and a *Secale-Agropyron* form with 56. Progress has been made in studies of the causes of sterility in F_1 hybrids, and methods of overcoming sterility have been developed. They include colchicine treatment of the F_1 and growing excised hybrid embryos on artificial media. Contrary to the view held by some critics of polyploidy, experimentally produced amphidiploids showed considerable hereditary variability and provide useful material for selection. In particular, wheat-*Agropyron* and rye-*Agropyron* amphidiploids had high protein contents and improved quality of gluten. On the other hand, improvements in grain size and vigour occurring in some polyploids are regarded primarily as physiological changes.

3149 Buchli, M.
Sorten- und Züchtungsfragen bei Gerste und Hafer, ein Rückblick und Ausblick. **(Questions of varieties and breeding of barley and oats, retrospect and outlook).**
Mitt. schweiz. Landw. Zürich-Oerlikon 1960 : **8** : 169–74.

Mention is made of old varieties which are no longer cultivated and the important characters of present varieties are discussed. Breeding aims are also considered.

3150 Laumont, P. & Erroux, J.
Quelles variétés de céréales devez-vous semer? **(Which cereal varieties should you sow ?).**
Rev. Élev. Cult., Alger 1960 : No. 134 : Pp. 9.

Cereal varieties recommended for cultivation in Algeria are described.

3151 Kretschmer, G.
Die Torsomethode, ein direktes Schnellverfahren für Frostresistenzprüfungen mit Getreide. **(The torso method, a direct quick procedure for frost resistance tests with cereals).**
Züchter 1960 : **30** : 251–54.

Further information is provided on a method already described [cf. XXX, 2528]; it may be used with all large-grained Gramineae. This method may also be adapted for determining resistance to other unfavourable conditions such as high temperatures. Four of the five winter wheats tested were ranked for frost resistance in the same order as their known winter hardiness.

3152 Slykhuis, J. T.
Differential hosts and new host records for five grass viruses.
Canad. J. Pl. Sci. 1961 : **41** : 211–16.

Tabulated data are provided on the reaction of a number of cereal and grass varieties to the viruses responsible for *Agropyron* mosaic, wheat streak mosaic, barley stripe mosaic, ryegrass mosaic and orchard grass mosaic.

3153 Tittel, C.
Die Resistenz von Getreidekeimpflanzen gegen Kaliumchlorat als Unterscheidungsmerkmal von Feucht- und Trockenherkünften. **(The resistance of cereal seedlings to potassium chlorate as a distinguishing character of material of damp and of dry provenance).**
Z. landw. Vers.- UntersuchWes. 1960 : **6** : 50–59.

A method for determining resistance to potassium chlorate is described. In contrast to Yamazaki's findings, winter and spring forms could not be distinguished by their resistance to chlorate [cf. XXIV, 954]. Grain ripened under dry conditions gave more resistant seedlings than that which ripened in a damp period; the effect of weather conditions differed with the variety.

3154 Razumov, V. I. & Olejnikova, T. V.
(The connexion between vernalization response and length of day).
Agrobiologija (Agrobiology) 1959 : No. 6 : 874–82. [Russian].

Alternative and spring varieties of wheat and spring varieties of barley and peas flowered earlier after vernalization treatments in short days at Puškin. However vernalization had no effect in accelerating flowering if the plants were given continuous light. In wheat varieties from Egypt and other southern countries, earing was accelerated by 13–23 days, as against 7–10 days in spring varieties from northern Europe such as Lutescens 62 or Diamant [Diamond].

WHEAT

3155 Matsumura, S.
Radiation genetics in wheat. V. Influence of irradiation time and temperature on the genetic effects of ionizing radiation in diploid wheat.
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 197–204.

[Cf. XXIX, 1361].

3156 Reznikov, V. F. & Drapova, O. I.
(Sowing good varieties has increased the collective farm's income).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 24–26. [Russian].

Recent winter wheat varieties proved highly productive on a farm in the Krasnodar territory. In 1958, Skorospelka 3b [Early 3b] yielded 37·0 c. per ha. and Bezostaja 1 [Awnless 1] 36·1 c. In the 1959 trials, both varieties were outyielded by another recent variety, Rannjaja 28 [Early 28].

3157 Gibšman, E. & Nikolić-Vig, V.
Rezultati makro-ogleda sa italijanskim i domaćim sortama pšenice na teritoriji Vojvodine u 1957/58 godini. **(Results of large-scale trials of Italian and local wheat varieties in Vojvodina in 1957–58).**
Savremen. Poljopr., Novi Sad 1959 : **7** : 271–80.

In winter-wheat trials conducted at eight centres, eight Italian varieties significantly outyielded two local lines. Highest yields were obtained from Produttore [Yielder] and San Pastore.

3158 Gocov, K.
(Choosing the right wheat varieties).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 9 : 9–13. [Bulgarian].

An account is given of varietal trials of 14, 301, T10, JuII and JuIII at Dobrudža, and varietal differences in yield, tillering, numbers of spikelets and grains per ear, hectolitre and 1000-grain weight, resistance to lodging, *Puccinia*, and cold, cultural requirements, and earliness are described.

3159 Sikka, S. M. & Jain, K. B. L.
A study of the differential response of some varieties of wheat to different environmental and cultural conditions. II. Performance under different levels of soil fertility and sowing dates.
Indian J. Agron. 1960 : **4** : 154–63.

A report is given on the performance of 24 NP wheats and five varieties recently developed at the Indian Agricultural Research Institute, New Delhi. They were tested for two years at the institute under irrigated conditions, with different manurial treatments and sowing dates. As under rainfed conditions [XXX, 2462], NP823 was notable for its environmental adaptability. NP824, which also gave good results under rainfed conditions, is considered to be promising as a yellow-rust and stem-rust resistant wheat for November sowing on rich soil in Delhi State. NP828, the third variety previously mentioned, had the defect of susceptibility to *Alternaria*.

3160 Sikka, S. M. & Nirmal Singh Maini
Reaction of some new Punjab wheats to the varying conditions of season, sowing date and manuring.
Indian J. Agron. 1960 : **4** : 230–37.

Of the 36 entries tested in the humid submontane and hot, dry western regions of Punjab, 24 were segregating derivatives of intervarietal crosses made at substations in the state, while the remainder were approved varieties or their reselections. The trials were carried out during 1950–52.

3161 Aziz, M. A.
Wheat improvement in the former Punjab.
Agriculture, Pakistan 1960 : **11** : 213–34.

An historical survey is given of wheat breeding in the Punjab region before partition, together with an account of breeding now in progress at Lyallpur and elsewhere in the area.

3162 Zomertarwe, 1961. **(Spring wheat, 1961).**
Landbouwvoorlichting 1960 : **17** : Bijl. 74; Ber. Rassenkeuze No. 291 : Pp. 2.

Data on the performance of seven varieties in the Netherlands are given. MGH50–14, which does well on clay soils, is being admitted to the official varietal list for 1961. MGH52–82, which is still undergoing preliminary tests, has shown promise, particularly on soils not well suited to wheat growing.

3163 Drezdić, P. & Jevtić, S.
Uticaj vremena, dubine i načina setve na prinos i neke osobine domaćih i italijankih sorti pšenice. **(The effect of time, depth and method of sowing upon yields and some properties of domestic and Italian wheat varieties).**
Savremen. Poljopr., Novi Sad 1959 : **7** : 15–32.

The Italian wheats San Pastore, Autonomia and R16 all proved highly productive in trials in Vojvodina, the aims of which were to establish the optimum cultural conditions for each variety under their new climatic and soil conditions.

3164 Sarić, M. R.
Rezultati prve godine gajenja italijanskih sorti pšenice u širokoj proizvodnji na teritoriji AP Vojvodine. (The first year's results of cultivating Italian wheat varieties on a large area in the Vojvodina Autonomous Republic).
Savremen. Poljopr., Novi Sad 1959 : 7 : 103–15.
San Pastore was the most productive of the Italian introductions tested in 1957–58. Autonomia took second place, Produttore [Yielder] third and Fortunato fourth.

3165 Swaminathan, M. S.
Rafi Ahmed Kidwai memorial prize.
Indian J. Genet. 1960 : **20** : 145–49.
The first Rafi Ahmed Kidwai prize for agricultural research has been awarded to B. P. Pal, Director of the Indian Agricultural Research Institute, New Delhi. A short biographical note is followed by a summary of his achievements, particularly in wheat breeding, during the last thirty years.

3166 Kulešov, G. F.
(The efficacy of different methods of selection of winter-wheat hybrids).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 10 : 23–26. [Russian].
At Saratov, lines selected from the F_3 to F_6 of intervarietal or interspecific hybrids, grown separately or as populations comprising several selected lines, had larger grain and were more productive than mass-selected material from identical hybrid populations. Data on the yields, 1000-grain weights, protein content and baking properties of some selections from Lutescens 230 x Kahetian are provided.

3167 McNeal, F. H., Berg, M. A. & Klages, M. G.
Evaluation of semidwarf selections from a spring wheat breeding program.
Agron. J. 1960 : **52** : 710–12.
Semidwarf selections from crosses of selection 14 from Norin 10 [Ministry of Agriculture and Forestry 10] x Brevor with Centana and Thatcher and the standard-height controls Centana, Thatcher and CI13242 (Pilot-Mida x Lee) were grown in five localities in Montana during 1959. Under dryland and irrigated conditions, the semidwarf wheats were respectively about 5 and 9 in. shorter than the controls. These differences were not materially affected by addition of N fertilizer. The semidwarf and standard types were essentially equal in yield and test weight. The reduced height of the semidwarfs was chiefly due to shorter peduncles, although other internodes were also shorter than in the standard varieties. As indicated by yield, test weight, straw weight, tiller number and kernel weight, the standard and semidwarf wheats responded in a similar manner to N fertilizer. The controls were however much more variable in plant height than the semidwarf selections, and in the former internode 3 was the most sensitive in its reaction to fertilizer whereas in the latter internode 5 was the most sensitive.

3168 Okamoto, M.
An awn suppressor located on chromosome 5B.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 2–3.
Observations on the F_1 of Chinese Spring (mono–5B) x *Secale cereale* (Kyoto University strain No. 230 7_{II} + B chr.) and mono-5B x *Triticum timopheevi* indicated that a gene, or genes, for suppression of awn development is present on chromosome 5B of Chinese Spring. This gene is not effective in Chinese Spring itself nor in hybrids with 4*x* *T. boeoticum*.

3169 Allan, R. E. & Vogel, O. A.
F_1 monosomic analysis involving a smooth-awn durum wheat.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 3–4.
Morphological examination of F_1 plants, monosomic for chromosomes I to XIV and derived from crosses between the smooth-awned durum selection 396 and the Chinese series, did not reveal the chromosome or chromosomes possessing the recessive smooth-awn factor (or factors) of 396. Explanations for this failure are discussed. Awns or awnlets of F_1 plants, monosomic for chromosomes of the A and B genomes except II and XIII, were barbed to the same degree as their respective disomic sibs. No awns were produced on plants monosomic for chromosomes II or XIII.
These two chromosomes were shown to carry recessive factors conditioning barbing of the keels of the outer glumes. Selection 396 carries the recessive alleles of *Hd* and B_2; it also carries on chromosome V a recessive factor for awn

development, *a*. Chinese Spring apparently has an awn-inhibiting factor, *B*, on chromosome XVI; this suppresses one or more of the awn-developing factors derived from 396. Culm waxiness was found to be controlled by a single dominant gene, *Wx*. This factor does not appear to be expressed in the hemizygous condition. Plants of the *Wxwx* genotype have a waxy phenotype whereas plants of *Wx* genotype, as well as *wxwx* plants, have waxless phenotypes. It is suggested that *Wx* provides two units of a precursor for waxiness while *wx* provides one unit, and that at least three units are required to bring about the waxy condition. It was noted that the date of anthesis was markedly late in plants monosomic for chromosome XIII; these plants flowered 11 days after their disomic sibs.

3170 Anderson, R. G. & McGinnis, R. C.
The inheritance and chromosomal association of a gene for glume pubescence in the common wheat variety, Loro.
Canad. J. Genet. Cyt. 1960 : **2** : 331–35.

Crosses of Loro with Reward, Prelude and Thatcher showed the pronounced pubescence of the glume of the first variety to be incompletely dominant over the light glume pubescence of the other three and to be dependent on a single gene. Monosomic analysis revealed that the gene for glume pubescence in Loro was situated on chromosome XIV. Segregation for winter habit was noted in Loro x Reward and Loro x Thatcher, suggesting that in each of these crosses the parents carried complementary genes for this character.

3171 Sheybani, H. A. & Jenkins, B. C.
The inheritance of glume pubescence in some *durum* varieties.
Canad. J. Genet. Cyt. 1961 : **3** : 23–25.

Glume pubescence was studied in the F_2 of diallel crosses involving the pubescent wheats var. *reichenbachii*, Golden Ball and Kahla and glabrous types vars. *leucurum*, *murciense*, *erythromelan* and *provinciale*, Stewart, Bald Medeah and Camadi. The results were interpreted according to the hypothesis that an allelic series, *Hg*, *hg* and hg_1, conditions glume pubescence. *Hg* is a dominant gene for pubescence, while *hg* for the glabrous condition is recessive to *Hg* but dominant to hg_1 for pubescence. The genotype *HgHg* is assigned to var. *reichenbachii* and Golden Ball, hg_1hg_1 to Kahla and *hghg* to all the glabrous varieties.

3172 Tsunewaki, K.
Monosomic and conventional analyses in common wheat. III. Lethality.
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 71–75.

Lethality was found to be controlled by two dominant complementary genes, Le_1 and Le_2. The variety Prelude carries Le_1 on chromosome V and Kharkov and Jones Fife carry Le_2 on chromosome XIII. Chinese Spring, S–615, Red Bobs, Elgin and Red Egyptian carry recessive alleles of both genes. Gene Le_1 is thought to be identical with Caldwell and Compton's gene *Le* [cf. XIII, 1204], but it is not certain whether the gene carried by Kharkov and Jones Fife is the same as Caldwell and Compton's Le_2. The degree of penetrance of the recessive allele in heterozygous plants is *ca.* 0·05%. [Cf. XXX, 3660].

3173 Frankel, O. H. & Munday, A. M.
The genetics of floral development in wheat.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 1–2.

On the basis of a series of speltoid x speltoid and speltoid x *Triticum vulgare* crosses the following genetic system is proposed. (1) In *T. vulgare*, *Q* determines normal flower formation in the first and subsequent flowers, irrespective of the presence or absence of other genes. (2) In speltoids, which lack *Q*, the second and subsequent flowers are normal in the presence of *A*. "The development of the first flower is conditioned by a polygenic series, presumably linked with *A*, with its plus (or minus) alleles determining the frequency of normal (or abnormal) development of the first flower, between the extremes of 'fertile' (St_F) and '1st flower sterile' (St_1).

"In the absence of the *A* allele, i.e. in plants with the *aa* genotype, formation of the second and subsequent flowers is also conditioned by a polygenic series. There is evidence that this is identical with that conditioning first flower development."

All *T. vulgare* wheats tested thus far have been shown to possess some alleles which impair normal flower formation in the speltoid state. It is suggested that "in the diploid ancestral genomes of hexaploid wheat, flower formation may have been conditioned by these gene systems now revealed in speltoids, and that under the cover of the later acquired *Q* factor these systems have become disused and are now in a state of gradual disintegration."

3174 WAGENAAR, E. B.
Studies on the genome constitution of *Triticum timopheevi* Zhuk. I. Evidence for genetic control of meiotic irregularities in tetraploid hybrids.
Canad. J. Genet. Cyt. 1961 : **3** : 47–60.

One line of *T. timopheevi* was crossed with 79 varieties representing the 4*x* species *T. durum*, *T. dicoccoides*, *T. dicoccum*, *T. araraticum*, *T. turgidum*, *T. pyramidale*, *T. persicum*, *T. polonicum*, *T. orientale*, *T. aureum*, *T. abyssinicum* and *T. aethiopicum*. With the exception of the hybrids with *T. dicoccoides* var. *nudiglumis* and *T. araraticum* var. *nachitschevanicum*, which were meiotically regular, forming 14_{II} in nearly all PMCs, all the hybrids were irregular at metaphase I, the average number of univalents varying from combination to combination. The extremes with respect to average number of univalents were found in two hybrids with *T. polonicum*, respectively having $2{\cdot}79_{I}$ and $12{\cdot}06_{I}$. The first of these two hybrids regularly showed cells without univalents (14_{II}, $1_{IV} + 12_{II}$ or $2_{III} + 11_{II}$). Among the remaining 77 combinations, trivalents occurred on an average of about 1 per cell, with maximum and minimum frequencies of 1·19 and 0·75; quadrivalent frequency was usually lower still. The occurrence of these multivalents was probably due to translocations between chromosomes of *T. timopheevi*. A few hybrids, particularly those with *T. turgidum*, had, however, significantly higher numbers of trivalents and quadrivalents, attributable to translocations imparted by the other parent. In *T. pyrimidale* var. *recognitum* x *T. timopheevi*, secondary pairing of almost all univalents was frequently observed. Crosses were made between parents which had given hybrids with high and low numbers of univalents in combination with *T. timopheevi*. The F_1s were all regular in meiosis, with good fertility.

It is concluded that *T. timopheevi* possesses genomes A and B. The irregular meiosis in its interspecific hybrids is ascribed to a set of genes specific to *T. timopheevi*, which partially prevented chiasma formation; a slight asynaptic effect may also have been present. The action of these genes was however modified by the genotypes of the hybrids, the wide range in univalent frequency thus being brought about. It is postulated that the 4*x* ancestor of *T. timopheevi* underwent mutation at loci directly or indirectly controlling pairing. These mutations resulted in a strong sterility barrier with its close relatives. Such isolation and subsequent selection pressure may have been responsible for the evolution of present-day *T. timopheevi*, which has a very limited area of natural distribution.

3175 FUKASAWA, H.
Studies on restoration and substitution of nucleus (genome) in *Aegilotricum*, VI. Some conspicuous characters appearing in male-sterile Emmer wheats.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 313–22.

Completely pollen-sterile plants (1) with 14 pairs of *Triticum durum* chromosomes in *Ae. ovata* cytoplasm [XXVIII, 2743; XXIX, 1354; XXX, 264] were two weeks later in date of heading than normal *T. durum* under usual conditions of sowing. Date of heading in (1) was fairly uniform, in contrast to the greater variability shown in this respect by individuals having $2–5_{I}$ derived from *Ae. ovata* in addition to 14_{II} from *T. durum*. Plants with $14_{II} + 1_{I}$ were as uniform in time of heading as those with only 14_{II}. Degree of retardation in heading in (1) was more pronounced with unusual dates of sowing, and varied according to the species of *Triticum* or variety used as pollen parent in back crosses of (1). Pollen-fertile plants (2) with *Ae. ovata* genomes + *T. durum* cytoplasm were retarded by about a week in heading date, compared with normal *Ae. ovata* or restored *Ae. ovata* from (*Ae. ovata* ♀ x *T. durum* ♂) x *Ae ovata*^{n}.

Plants of type (1) were as uniform in plant height as normal *T. durum* but were much shorter, although taller than individuals with $14_{II} + 1–5_{I}$ from *Ae. ovata*. The difference between normal plants and type (1) varied according to sowing date, being greater in the later than in the earlier sowing. Hybrids of type (1) ♀ with *T. dicoccum* ♂ parents shorter than normal *T. durum* were shorter than (1). When normal *T. durum* was pollinated by $14_{II} + 1_{I}$ substitution lines, the resulting 14_{II} plants were normal in height and pollen fertility [cf. XXIV, 2817].

Plants of type (1) displayed a conspicuous variegation, whitish dots and stripes appearing on the leaves. Its occurrence varied with stage of growth, being most pronounced during winter. No variegated leaves were observed in strains derived from successive back crosses of type (1) ♀ x *T. durum* var. *hordeiforme* ♂ with var. *hordeiforme* ♂ or in ♂-sterile *T. dicoccum* from repeated back crosses of type (1) ♀ x *T. dicoccum* ♂. No variegation was seen in F_1

Ae. ovata ♀ x *T. durum* ♂ or in the back cross of this hybrid with *T. durum* ♂. In further back crosses with *T. durum* ♂, however, many plants exhibited various degrees of variegation. As a rule, individuals having more extra chromosomes from *Ae. ovata* had less variegation. Different degrees of variegation were however noted even in plants with the same chromosomal configuration, possibly because different *Ae. ovata* chromosomes were present. Variegated leaves were never observed in restored *T. durum* strains from reciprocal back crosses such as normal *T. durum* ♀ x a substitution line ♂. Paper-chromatographic analysis indicated that the chlorophyll content of variegated leaves was reduced to about 70% of that of normal ones.

It is concluded that, as in the case of pollen sterility, delay in heading date and reduction in height in (1) may be attributed to disharmony between *Ae. ovata* cytoplasm and *T. durum* genomes, but that, in contrast, variegation is dependent on interaction between *Ae. ovata* cytoplasm and specific combinations of genes introduced by back crossing.

3176 Rusmini, B.
Ibridi *Aegilops* x *Triticum*. (**Triticum x *Aegilops* hybrids**).
Genet. agr. 1960 : **10** : 344–65.

The results of attempted crosses between eight species of *Aegilops* and *T. turgidum, T. durum* and *T. vulgare* are reported. No set was obtained from any of the diploid species of *Aegilops*; the tetraploid species, with the exception of *Ae. cylindrica*, crossed with both tetraploid and hexaploid wheats. The following hybrids were obtained: *Ae. ovata* x *T. vulgare, Ae. triaristata* x *T. durum, Ae. triaristata* x *T. vulgare, Ae. ventricosa* x *T. durum, Ae. triuncialis* x *T. turgidum, Ae. triuncialis* x *T. vulgare, Ae. crassa* x *T. turgidum, Ae. crassa* x *T. vulgare* and *Ae. crassa* x *T. sphaerococcum*. All were very resistant to lodging. The highest fertility was observed in the hybrids *Ae. triaristata* x *T. vulgare* and *Ae. ventricosa* x *T. durum*. Treatment with colchicine and gammexane increased the fertility. A certain resemblance to *T. spelta* was noted in hybrids of *Ae. ventricosa* x *T. durum*.

In the F_2 most hybrids, particularly those from *Ae. crassa*, suffered from rust attack; some of those from *Ae. triaristata* x *T. vulgare* however, including the most fertile hybrid, remained free. All hybrids were again resistant to lodging, those from *Ae. ovata* and *Ae. triaristata* being outstanding in this respect. The most fertile were hybrids from *Ae. ventricosa* x *T. durum* and *Ae. triaristata* x *T. vulgare*, the best plants of which bore 579 and 645 grains respectively. A certain amount of segregation occurred though the hybrids remained intermediate between the parents in most respects. The resemblances to *T. spelta* increased in *Ae. ventricosa* x *T. durum*.

3177 Rajhathy, T.
Continuous spontaneous crosses between *Aegilops cylindrica* and *Triticum aestivum*.
Wheat Inform. Serv. Kyoto 1960 No. 11 : p. 20.

Investigations on Szent Endre, an island on the Danube near Budapest, indicated that *Ae. sancti-andreae*, which was named as a species in 1917, arises regularly as a result of hybridization between *Ae. cylindrica* and *T. aestivum*.

3178 Šulyndin, A. F. & Naumova, L. N.
(The crossability of hard wheat with rye).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **135** : 1244–46. [Russian].

Though *Triticum durum* formed three times as many hybrid grains as *T. aestivum* in crosses with *Secale cereale* at Har'kov, the proportion of viable grains was appreciably lower, the results varying with the seed-parent ecotype. Winter hard wheats produced most hybrid grains and spring forms the fewest, the semi-winter forms occupying an intermediate position. The choice of the rye variety acting as pollen parent had little or no effect upon grain set, except in 1959, when hard winter wheats set more grains from pollination by Saratovskaja Krupnoplodnaja [Saratov Large-grained] than with Har'kov 55. Most of the F_1 of *T. durum* x *S. cereale* was completely sterile and only a few fertile grains were obtained by back crossing to the parental forms. Hard wheat types raised from these grains are being multiplied for further observations.

3179 Nakajima, G.
(Cytogenetical studies of trigeneric hybrids. V. The chromosome numbers, external characters and fertility of TperHRF$_2$ plants).
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 133–41. [Japanese].

Eighty-nine F_2 plants of the cross (*Triticum*

persicum x *Haynaldia villosa*) x *Secale cereale* were raised. The chromosome numbers ranged from 38 to 58 with an ill-defined mode around 47–49. The F_2 plants varied considerably in spike characters, this variation not corresponding closely with chromosome number. However, rye characteristics were more apparent in segregates with chromosome numbers of 46 or below.

3180 Rommel, M.
Identification of accessory chromosomes in *Triticum durum* x *Secale cereale* hybrids.
Canad. J. Genet. Cyt. 1961 : **3** : 18–19.

Out of 22 F_1 hybrids from *T. durum* 'Stewart' x *S. cereale* 'Canadian Prolific', two had $2n = 23$, instead of the expected $2n = 21$. Two of the 23 chromosomes were much shorter than the others. Both had a centromere and one long and one very short arm. Since the type of accessory in the two hybrids was the same as that subsequently found in the rye parent and since accessories have not been noted in *T. durum*, it was concluded that the two extra chromosomes were transmitted through the rye pollen. The functioning of this pollen and crossability between the two genera were evidently not influenced by the presence of the accessories.

3181 Vettel, F. K.
Mutationsversuche an Weizen-Roggenbastarden (*Triticale*). II. Zytologische Untersuchungen und Fertilitätsbestimmungen an *Triticale* Rimpau und einigen Mutanten. [**Mutation experiments on wheat-rye hybrids (*Triticale*). II. Cytological investigations and determinations of fertility in *Triticale* 'Rimpau' and some mutants**].
Züchter 1960 : **30** : 181–89.

In further investigations [cf. XXX, 2491], information was obtained on the chromosome configurations in metaphase I and anaphase I and II in three forms of *Triticale* and some mutants. There was some correlation between fertility and meiotic stability expressed as the percentage of normal PMCs or pollen. The frequency of aneuploids averaged 31% in somatic cells and 42·1% in gametes; there was a negative correlation between the aneuploid frequency and fertility. Certain parallels between *Titicale* and autopolyploid Tetra rye in cytological behaviour and fertility are discussed.

3182 Wienhues-Ohlendorf, A.
Die Ertragsleistung rostresistenter 44- und 42-chromosomiger Weizenqueckken-Bastarde. (**The yield performance of rust-resistant wheat-*Agropyron* hybrids with 44 and 42 chromosomes**).
Züchter 1960 : **30** : 194–202.

The hybrids with 44 chromosomes had the *Agropyron* chromosome conferring rust resistance added disomically to the *Triticum* set of chromosomes. The *Agropyron* chromosome caused a reduction in the germination percentage and the number of stems produced and retarded development but in most cases increased the 1000-grain weight. Considerable variation in yielding ability occurred amongst the different hybrids and some equalled susceptible wheats of similar origin with 42 chromosomes. The *Agropyron* chromosome had a more favourable effect on yielding ability when the arm carrying resistance to yellow rust was lacking.

In the hybrids with 42 chromosomes the *Agropyron* chromosomes for rust resistance replaced a pair of wheat chromosomes; the range of yields from these lines was similar to that of the 44-chromosome hybrids. In the substituted hybrids, tillering was increased rather than the 1000-grain weight and the absence of the wheat chromosomes seemed to have more effect than the presence of the *Agropyron* chromosomes.

The possibilities of breeding with both types of hybrid are discussed.

3183 Tjulina, L. R.
(**The resistance of winter-wheat varieties to mildew**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 52–53. [Russian].

The wheat-*Agropyron* hybrids 587, 593, 599 and 690 were distinguished by a high degree of mildew resistance in tests carried out at the Agricultural Institute for Central Districts of the Nonchernozem Belt and are thought to be of value in breeding. Crosses between 599 and the susceptible wheat-*Agropyron* hybrid 186 gave progenies differing in resistance; a greater proportion of resistant forms occurred when 599 was employed as the ♀ parent. The resistance of both 186 x 599 and 599 x 186 was greatly improved by back crossing to 599, a particularly high percentage of resistant plants being obtained from (599 x 186) x 599.

3184 Swaminathan, M. S. & Prabhakara Rao, M. V.
Frequency of mutations induced by radiations in hexaploid species of *Triticum*.
Science 1960 : **132** : p. 1842.

The frequency of all phenotypically detectable mutations induced by X rays and treatment with P^{32} and S^{35} was determined in the M_2 of six species. One variety of each species was studied, the *T. aestivum*, *T. compactum* and *T. sphaerococcum* varieties being spring types and the remainder having winter habit. The trend in frequency and spectrum of mutations induced by the different treatments was similar in all species. *T. spelta*, *T. macha* and *T. vavilovi* had a significantly lower frequency of mutation than *T. aestivum*, *T. compactum* and *T. sphaerococcum*. Differences between species within each of these two groups were not significant. Of the mutations affecting *T. aestivum*, *T. compactum* and *T. sphaerococcum*, respectively 31·07, 39·92 and 63·93% were attributable to loss or duplication of the appropriate species-differentiating locus (*Q*, *C* or *S*). Mutations in *T. spelta* chiefly affected awning or ear density, while a change to the *T. aestivum* type of ear and internode structure was the only kind of mutation recorded in *T. macha* and *T. vavilovi*. Visible mutants may appear in a polyploid only at loci at which phenotypic buffering caused by duplications does not exist. The results suggest that the number of such loci, while generally few in 6*x* *Triticum* species, is relatively higher in the free-threshing spring wheats.

3185 Fujii, T.
Radiosensitivity in plants IV. Experiments with several mutant strains of einkorn wheat.
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 110–19.

Sensitivity to X and γ rays was studied in the X_1 and X_2 of normal plants, three chlorophyll mutants (*chlorina*, *basi-viridis* II and *virido-albina*) and three morphological mutants (early, slender and irregular-ear) of *Triticum monococcum* var. *flavescens*. In the X_1, little difference was found between normal and mutant plants in germination percentage, plant height and fertility. In the X_2, however, germination percentages varied widely. In lines with high germination percentages, the chlorophyll mutation rate and the spectrum of chlorophyll mutations were similar to those of normal plants. It is concluded that, where only one major gene has mutated, the response of mutants is similar to that of normal plants. [Cf. XXX, 2386].

3186 Matsumura, S.
Comparison of radiation effects of beta- and gamma-rays on Einkorn wheat.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 12–13.

The results of this investigation are in general agreement with results previously reported [cf. 289].

3187 Matsumura, S.
Radiation effects of fast and thermal neutrons on wheat : I. Genetic effects of neutrons on Einkorn wheat.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 5–7.

Dormant seeds of *Triticum monococcum* var. *flavescens* were subjected to varying doses of thermal-neutron irradiation. Subsequent observations indicated that the higher the dose, the greater was the frequency of chromosome aberrations and chlorophyll mutations. The comparative effects of X, γ and fast-neutron irradiation on einkorn were also studied. Information is provided on the relative biological effectiveness of these three forms of radiation [cf. 289].

3188 Katsuya, K.
Susceptibility of the *albina* mutant of Einkorn wheat to leaf and stem rusts, *Puccinia triticina* and *P. graminis*.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : p. 16.

The *albina* mutant proved to be susceptible to race 21B of *P. triticina* and race 21 of *P. graminis* f. sp. *tritici*. Normal plants were resistant to the former pathogen but susceptible to the latter.

3189 Fujii, T.
Recovery of chlorophyll content in some mutants in Einkorn wheat, *Triticum monococcum flavescens*.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 16–17.

[Cf. XXX, 2494].

3190 Enčev, Ja. & Cvetkov, S.
(The choice of grafting components and heterosis in vegetative and sexual hybrids).
Selskostopan. Misăl 1959 : No. 10 : 767–74. [Bulgarian].

More noticeable "heterotic" effects were

observed in the vegetative hybrid wheat/rye when variety 11 was used as scion than variety 14, rye variety 59 in both cases supplying the stock. A heterotic hybrid was also obtained by grafting the wheat variety 159 on 14; this vegetative hybrid showed more pronounced heterosis than the sexual hybrid between these varieties. A study of vegetative and sexual hybrids of wheat and of barley suggests that heterosis can be maintained in later generations by single-plant selection and by raising hybrid progenies on rich soil.

3191 Obolensky, G.
Grafting of plant embryos and the use of ultrasonics.
Qual. Plant. Mater. veg. 1960 : **7** : 273–88.

Three techniques are described for grafting embryos or parts of embryos from one plant on to another. At Hristinovka in the Ukraine, wheat-wheat, wheat-rye and wheat-maize grafts were made and descriptions are given of some of the plants developed from them. Changes were effected in morphology, in frost, lodging and insect resistance and in maturation period. It is suggested that ultrasonic vibrations might be usefully employed to improve the grafting methods.

3192 Ponamarenko, V. P.
(Introducing new varieties).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 62–63. [Russian].

Mention is made of the recent winter wheat Bezostaja 1 [Awnless 1] and winter barley Giaginskaja 395 which outyield the older varieties in the Krasnodar territory by 2–3 c. per ha.

3193 Mitkov, T.
(The breeding of soft winter wheat in our country).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 8 : 39–42. [Bulgarian].

Several recent varieties bred in Bulgaria, including 301, adapted to cultivation in the north, and Jubilejna 11 and 111 [Jubilee 11 and 111] in the south are listed. The first variety is winter hardy, highly productive and resistant to *Puccinia* and drought in the spring, and has firm straw. The other two varieties are characterized by earliness, short straw and higher yields than 301; they lodge less then other wheats on rich soil.

3194 Efrat, S. [Y.], Berkovitz, I. [Berkovits, Y.] & Karhi, Z. [Ts.].
(Mexican 708, a new variety of soft wheat).
Sadeh (Field)/Hassadeh 1960 : **41** : 132–34. [Hebrew].

The variety Mexican 708, which was introduced into Israel in 1953, is described. In 1956–1960 yield trials, conducted at a number of centres throughout Israel, Mexican 708 generally outyielded the two other varieties tested, Neve Yaar and Florence Aurore.

3195 **Tendoy winter wheat for western dryland.**
Crops & Soils 1961 : **13** : No. 4 : p. 18.

[Cf. 1735].

3196 Pimentel, H.
Nova variedade de trigo para o Estado do Paraná. **(A new variety of wheat for the State of Paraná).**
Bol. téc. Inst. agron. Sul. 1960 : No. 27 : Pp. 29.

BH46, a new, early-maturing wheat variety, was developed at the Agronomic Institute of Belo Horizonte, Minas Gerais, as a result of hybridization and selection involving PG1, Fronteira and Mentana. The variety has given excellent results in yield trials conducted in Paraná and in certain other wheat-producing regions of Brazil.

3197 Pisarev, V. & Žilkina, M.
(Krasnozernaja, a new spring-wheat variety).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 11 : 43–46. [Russian].

[Cf. XXVII, 2787].

3198 Ostrejko, S. A.
(A new form of wheat).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 11 : 133–37. [Russian].

A Latin description is given of a form selected from Bes-Bas-Bidaj [Five-eared wheat] in Kazahstan and designated *Triticum turgidum* var. *aeternum*. It has an exceptionally high number of florets and forms up to ten grains per spikelet, the 1000-grain weight being 38·4 g. Another unusual characteristic is that it continues differentiation at the growing point, especially when some spikelets are removed or the grains are irradiated with thermal neutrons. Glumes representing reduced flowers are present

in some spikelets. The new form has on the average 112 grains per ear as against 72 in Bes-Bas-Bidaj, but the grain of Bes-Bas-Bidaj is larger.

3199 Pujdak, L. D.
(The first year of the seven-year plan).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 6–9. [Russian].

The strong-floured wheat Saratov 29, which has been recently introduced in the Orenburg province, outyields the local standard varieties by 1–3 c. per ha. Other recent introductions include Saratov 210, another high-yielding variety with strong flour.

3200 Favero, A.
Due nuove varietà di grano duro. **(Two new varieties of hard wheat).**
Sementi elette 1960 : **6** : No. 6 : 62–63.

Two hybrids of *Triticum durum* are described. Casale 92, a hybrid of Azizia x Sen. Cappelli, ripens a little before Cappelli, has short straw resistant to lodging and is resistant to rusts and free from mealy endosperm. It yields up to 32 c. of grain per ha., the mean being 25 c.; the quality of the grain is equal to that of Cappelli.

Vera 63, a hybrid of Eiti x Russello SG7, is very early, ripening in Sicily at the end of May. It has short straw resistant to lodging and to excessive heat or humidity; its grain is free from mealy endosperm and equal to the preceding variety in quality, its mean yield being 26 c. per ha., with maxima up to 31 c.

3201 Joshi, A. B., Kohli, S. P. & Negi, L. S.
N.P. 829—the successor to Ridley.
Indian Fmg. 1960 : **10** : No. 8 : 6, 8.

NP829, an early-ripening wheat developed from a cross of NP165 with a Timstein derivative from Australia, is available for growing in the foothills of northern India at altitudes of up to 2000 ft. Highly resistant to leaf, stem and yellow rusts and to loose smut, it has outyielded Ridley by 21%.

3202 Pal, B. P., Kohli, S. P. & Negi, L. S.
N.P. 809 is proof against rusts.
Indian Fmg. 1960 : **10** : No. 8 : 7–8.

NP809, developed from [(Democrat x Pb.C518) x (Spalding's Prolific x NP114)] x E220, is highly resistant to leaf, stem and yellow rusts and to loose smut. Widely adapted in the hills of northern India, it is suitable for altitudes ranging from 2500 to above 6000 ft.

3203 **New wheats for 1961 production.**
Agric. Res., Wash. 1961 : **9** : No. 7 : p. 16.

Information is given on the hard red winter wheats Ottawa, Kaw and Milam, developed in the USA. Ottawa is noteworthy for its high degree of resistance to soil-borne mosaic. It also has good resistance to Hessian fly, leaf rust and race 56 of stem rust. Resistant to leaf rust and bunt and moderately resistant to race 56 of stem rust, Kaw is early in ripening and, except for being less winter hardy, is similar to Wichita. Milam has more disease resistance than any variety now grown in southern Texas for pasture and fodder grain. Strong strawed, it ripens slightly earlier than Quanah or Atlas 66.

3204 Sawicki, J.
Studia nad miejscowymi odmianami zbóż z rejonu Karpat. Cz. II. Pszenice jare z powiatu limanowskiego i nowotarskiego. **(Studies of the local cereal varieties of the Carpathian region. II. Spring wheats of the Limanowa and Nowy Targ districts).**
Acta agrobot., Warszawa 1960 : **9** : No. 2 : 5–62.

Data on straw, ear and grain characters, vegetative period, ripening period, pubescence and waxiness are given for local forms of the botanical varieties *lutescens*, *milturum*, *erythrospermum* and *ferrugineum*. Morphologically and physiologically the lines fall into two groups, one from a mean altitude of 808 m. and the other from 681 m. Lines in the first group were characterized by earlier heading, a longer ripening period, more ears per plant, lower yields of grain per ear and per plant, lower 1000-grain weight, shorter straw, shorter and more compact spikes and a lower straw yield per plant than those of the second group. Awned wheats generally had a higher 1000-grain weight and hl. weight than awnless. In a few lines a high grain weight was associated with a short vegetative period. Studies of the variation of the different characteristics between seasons and between and within lines showed that tooth length (in awned wheat), length of ear, number of spikelets per ear, grain length, 1000-grain weight and straw length are the most valuable in differentiating between lines, while ear density, grain width, length/width ratio of grain and length of vegetation period are less useful. In preliminary tests, a number of lines have exceeded Ostka Kleszczewska

[Awned Kleszczewska] and Ostka Chłopicka [Awned Chłopicka] in grain and straw yield, and, because of their earliness, many lines have shown field resistance to rust and high resistance to loose smut. Within vars. *erythrospermum* and *lutescens*, a large number of lines were resistant to lodging. The yield coefficient, ears per plant x grain yield of the main ear, appears to be a useful criterion in the early stages of selecting for yield.

3205 Tanaka, M.
Spring- and winter-types of artificial autopolyploids and amphidiploids in *Triticum* and *Aegilops*.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : p. 21.

Tabulated information is provided on the chromosome number, genome type and time of maturity of nine artificial autopolyploids and 24 artificial amphidiploids of *Triticum* and *Aegilops*.

3206 Wagenaar, E. B.
Cytological studies of the development of metaphase I in hybrids between *Triticum timopheevi* Zhuk. and *T. durum* Desf.
Canad. J. Bot. 1961 : **39** : 81–108.

In PMCs of *T. timopheevi* x *T. durum* var. *leucomelan* and *T. durum* var. *obscurum* x *T. timopheevi*, a progressive increase in the average number of univalents was found as development proceeded through early, medium, late and very late stages of metaphase I. This is explained on the assumption that the less irregular cells pass through metaphase more rapidly than the more irregular ones; univalent population curves constructed for medium, late and very late stages of metaphase I indicate that the univalents of the less irregular metaphase cells reach the equator slightly earlier than those of the more irregular cells. It is argued that, in normal tetraploid *T. timopheevi* or *T. durum* PMCs, certain cellular forces achieve equilibrium when 14 bivalents are coorientated at the equatorial plate; since the state of equilibrium is easily attained, metaphase I is of short duration. In the hybrid PMCs, where 5–9 univalents per cell are present, the same forces control cell division, but, since these cells rarely form 14 bivalents, they require more time to reach equilibrium. Equilibrium is attained in the latter case by "filling up" the equatorial plate with univalents and the evidence suggests that anaphase I does not begin until approximately 70% of the univalents have reached the plate.

3207 Riley, R. & Chapman, V.
The D genome of hexaploid wheat.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 18–19.

At the Plant Breeding Institute, Cambridge, England, hybridization between *Triticum aestivum* 'Chinese Spring' and *Aegilops squarrosa* has recently been effected. Meiotic analysis of the hybrid showed that at metaphase I there were usually 7 bivalents per cell; most of the bivalents were closed rings, often with 3 or 4 chiasmata.

No more than 7 bivalents were observed in any cell and no multivalents occurred. There was thus no pairing that could not be accounted for by associations within the D genome. This suggests that pairing in euhaploids of *T. aestivum* can rarely occur between A and B genome chromosomes. The investigations of Sears and Okamoto on chromosome pairing in euhaploids showed that most pairing is either between A and D genome chromosomes or within the A genome. "Thus diploidization appears to be more effective for the A and B genomes than for these genomes and the D genome."

The pairing between the D genomes of *T. aestivum* and *Ae. squarrosa* is much closer than that between the A genomes of *T. aestivum* and *T. monococcum*. "This presumably reflects the more recent separation of the D genomes, which have consequently diverged less in structure and gene content than the A genomes."

3208 Watanabe, Y. & Mukade, K.
Studies on the induction of mutations by P^{32} in wheat. II. Some relations between chromosomal aberration and seed fertility in R_2 generation.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 13–15.

A total of 278 R_2 plants were classified according to the presence or absence of chromosome aberrations and morphological variations. Tabulated information is provided on the relation between these abnormalities and seed fertility. The seed fertility of certain plants with chromosomal aberrations was as high as in control plants, while in other individuals, not showing visible morphological changes, fertility was less than 50%. This indicates that it is not safe to select plants only by the external characters or by the seed fertility without cytological examinations.

3209 Nezu, M.
Radiation effects of fast and thermal neutrons on wheat: II. Relation of ploidy to chromosome aberrations.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 7–8.

Meiotic irregularities induced by various radiation treatments in the 4*x* wheat *Triticum durum* var. *reichenbachii* and in 6*x* *T. vulgare* var. *erythrospermum* were compared. Univalents and multivalents arising from reciprocal translocation were the most frequent aberrations induced by thermal neutrons. Univalents and hexavalents were more frequent in 6*x* plants than in 4*x* plants. The average number of breakages per cell increased nonlinearly with increasing dosage. In 4*x* plants exposed to 2·5 kr. fast-neutron irradiation, the number of breakages observed was 4·47 per cell, while in 6*x* plants the number was approximately 5·26 per cell. About three times as many breakages were induced in 6*x* cells exposed to 10 and 20 kr. X and γ irradiation as in 4*x* cells subjected to identical treatment. X irradiation induced about $1\frac{1}{2}$ times as many breakages as γ irradiation at the same dosage rate in both 4*x* and 6*x* species. There were no differences in the sensitivities of the two species with respect to X and γ irradiation effects on fertility.

3210 Watanabe, Y. & Mukade, K.
Studies on the induction of mutations by P^{32} in wheat: I. Chromosomal aberrations in R_2 generation, with special reference to the frequent occurrence of monosomics.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 9–11.

Tabulated information is provided on the chromosome variations observed at metaphase I in the pollen mother cells of R_2 plants derived from two $2n = 42$ R_1 plants and one $2n = 41$ monosomic R_1 plant. Translocations, deficiencies, nonpairing and various combinations of these aberrations were noted. The average percentage of monosomics in the progeny of the $2n = 42$ R_1 plants was 11·47%, while in the progeny of the R_1 monosomic the average percentage was 6·56%.

3211 Mochizuki, A.
Addition of individual chromosomes of *Agropyron* to durum wheat.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 22–23.

A series of monosomic addition lines, with 28 wheat chromosomes and one chromosome designated e from diploid *A. elongatum*, were produced at Hyogo Agricultural College, Japan. From the above lines, disomic addition lines have now been developed. The phenotypes of the addition lines are compared with that of the original wheat, *Triticum durum* 'Stewart'. Vigour and fertility in the disomics were less than in the durum parent. In general, the disomics were relatively stable and produced only a small proportion of progeny with irregular chromosome number.

In three of the monosomic addition lines, no associations were observed between wheat and *Agropyron* chromosomes; in three other lines, trivalent associations were noted, while in the seventh line, trivalent and pentavalent associations occurred. It is concluded that four chromosomes are at least partially homologous between Stewart and *Agropyron elongatum*.

3212 Mándy, Gy., Zsolt, J. & Pál, Gy.
Studies of the germination of Hungarian wheat varieties.
Acta bot. Acad. Sci. hung. 1957 : **3** : 261–73.

Varietal differences in optimum temperature for germination, imbibition, sensitivity to NaCl and KCl and tolerance of treatment with 2,4-dichlorophenoxy-acetic acid were found among four varieties. Bánkút 1202 and F481 germinated best at 15° C. and Székács 1055 and UN2 at 10° C. F481 was least sensitive to treatment with salt solutions.

3213 Gorskij, A. M.
(Variability of varietal population constituents in spring-sown winter wheat and rye in different geographical locations).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 101–26. [Russian].

A collection of 89 winter wheats and 100 winter ryes of different geographical origin was sown in spring in four widely separated localities in the Soviet Union. All proved heterogeneous in respect of the proportion of plants that came into ear and the time at which the ears developed. Even cultivars such as the wheat Ukrainka 246, that had originated by single plant selection, proved no exception; most varieties also proved heterogeneous in morphological characters, though when sown under normal conditions they appeared perfectly uniform. The varieties were arranged in four groups according to the amount of earing they gave in spring sowings. Alternative forms, capable of being used as either spring or winter forms, were found only

in *Triticum aestivum*; no such forms were found in other species of wheat or in rye. The varieties that proved most suitable for sowing in spring for fodder production are enumerated.

3214 Fajnbron, B. D.
(Biological characteristic of a "special group" of wheats, obtained by conversion of spring varieties into winter varieties).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 9 : 138–44. [Russian].

Observations on the progeny of the spring wheat Milturum 321, which had been trained for the winter habit for several generations at the Timirjazev Agricultural Academy, showed that it comprised 59% of true winter wheats, 25·2% giving spring and winter forms within a family in spring sowings, and 15·8% which eared as spring forms but overwintered. These last forms are regarded as wheats belonging to a special group characterized by great environmental plasticity. The unstable inheritance of these wheats was confirmed by studies on vernalization and variability in overwintering capacity after sowing in spring for one or more generations and after crossing with the winter wheat Moscow 2453 or the spring wheat Lutescens 62.

3215 Morrison, J. W.
The monosomic analysis of growth in winter wheat.
Z. VererbLehre 1960 : **91** : 141–51.

Growth habit was studied in monosomic and disomic hybrids from crosses of Cornell, Kharkov and Kanred with 21 monosomics of Chinese Spring. Spring growth habit was dominant over winter habit, all disomic hybrids exhibiting spring growth. Monosomic hybrids showed varying degrees of spring or winter growth depending on the chromosome involved and, in some cases, on the winter wheat variety.
The major gene (or genes) for winter growth habit is located on chromosome XVIII of all varieties. While the genes on chromosomes XVIII and IX responded to cold treatment, that on chromosome X gave some response to light treatment. Chromosomes VI, XIV and XX of Kanred and XXI of Kharkov probably carry genes having a slight effect towards lateness. In Kanred, genes for earliness are present on chromosomes III, XVII and, although less effective, XXI. For both earliness and lateness some chromosomes gave inconsistent reactions.

3216 Lju, D.-C. [Liu, T.-C.]
(Accumulation of radioactive phosphorus in the pistils of a spring wheat pollinated with the pollen of different varieties).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 120–25. [Russian].

Measurements of the radioactive phosphorus in the pistils of Moskovka [wheat from Moscow] after pollination with labelled pollen of another variety or a pollen mixture indicated that Moskovka preferred unmixed pollen of most of the varieties tried to pollen mixtures of the same varieties. The findings were confirmed by studies of grain set. The highest percentage of grain was set when Moskovka was pollinated by Lutescens 62 and the lowest when it was pollinated with self pollen + Lutescens 62 + Milturum 162 + G 5/5 + Balaganka.

3217 Chopra, V. L., Jain, S. K. & Swaminathan, M. S.
Studies on the chemical induction of pollen sterility in some crop plants.
Indian J. Genet. 1960 : **20** : 188–99.

Of a number of chemicals tested on wheat, tomato and onion, maleic hydrazide was the most effective in inducing pollen sterility. In the case of tomato, which has a long flowering period, the effects of spraying lasted for two weeks, after which there was a gradual reversion to the fertile condition; the effective concentration in this case varied with the age of the plant, older plants requiring higher dosages to produce the same effect.

3218 Sarić, M., Hadžijev, D. & Ćupina, T.
Sadržaj hlorofila, karotina i ksantofila kod nekih sorti pšenice. **(The content of chlorophyll, carotene and xanthophyll of some wheat varieties).**
Savremen. Poljopr., Novi Sad 1959 : **7** : 743–56.

Analysis of the leaves of 17 varieties revealed wide variations in the content of chlorophyll, β-carotene and xanthophyll. Chlorophyll content, which varied from 0·201% to 2·157% (on a dry matter basis), was highest in Étoile de Choisy. The highest content of carotene (0·069%) and xanthophyll (0·097%) was found in Frio.

3219 Cetl, I.
The size of pollen grain of the genus *Triticum* L.
Biol. Plant., Praha 1960 : **2** : 287–91.

Measurements of pollen grains from diploid,

tetraploid and hexaploid species showed pollen grain size to increase with increase in chromosome number but not proportionally. The relative influences of different genomes were calculated taking pollen grain size in the diploids (genome A) as 100. The influence of genome B was found to be only 62%, that of genome D 29%, and that of genome G 18%.

3220 Wilson, J. A. & Ross, W. M.
Haploidy in twin seedlings of winter wheat, *Triticum aestivum*.
Crop Sci. 1961 : **1** : p. 82.

The average frequency of twins in CI12804, Wichita and CI13285 was 1 per 3200 seedlings. The frequency of haploids in all the twins obtained was 1 in 20; triploids occurred more frequently than haploids. Culms, leaves and ears were reduced in size in the haploids but the plants were vigorous and tillered profusely. It is concluded that haploids isolated from twins could be used to supplement the conventional method of obtaining monosomic lines in wheat.

3221 Singh, H. G. & Lamb, C. A.
Mineral and protein content of wheat grain as influenced by variety, soil, and fertilizer.
Agron. J. 1960 : **52** : 678–80.

An experiment on Pawnee, Seneca, Butler and Cornell 595 at two centres in Ohio revealed significant intervarietal differences in the amount and composition of the ash, irrespective of locality and fertilizer treatment. Considerable intervarietal differences in protein content and bushel weight were also found.

3222 Pollmer, W. G.
Analyse von Weizenqualitätsuntersuchungen in Baden-Württemberg 1954 bis 1957. (**Analysis of wheat quality investigations in Baden-Württemberg, 1954 to 1957**).
Z. Acker- u. PflBau. 1960 : **111** : 364–80.

Data on quality characteristics in relation to area of cultivation are given for seven varieties tested in ten different areas.

3223 Belderok, B., Meppelink, E. K. & de Ruiter, D.
Methoden ter bepaling van de bakkwaliteit van kleine monsters tarwe. (**Methods for the determination of baking quality in small samples of wheat**).
Sticht. Ned. Graan-Centrum Wageningen 1960 : Pp. 47.

The following micromethods are described: (1) determination of contents of protein, wet gluten and dry gluten; (2) Berliner's swelling test; (3) Zeleny's sedimentation test; (4) wheat-meal fermentation test; (5) Finney and Yamazaki's water retention test; (6) Maes and Pirotte's water retention test; and (7) the microbaking test developed at the Netherlands Grain Centre. A comparison of the results of these methods with those of a standard baking test showed that (7) gave the best indication of baking quality. Tests (3), (5), (6), and to a lesser extent (4) gave satisfactory results. Tests (3) and (4), which are simple to carry out, are recommended to breeders, a detailed description of apparatus and procedure being given.

3224 Kemp, J. G., Whiteside, A. G. O., MacDonald, D. C. & Miller, H.
Ottawa micro flour mill.
Cereal Chem. 1961 : **38** : 50–59.

Information is provided on a flour mill devised at the Genetics and Plant Breeding Research Institute, Canada Department of Agriculture, Ottawa. "It consists of four stands of rolls with two breaks and two reductions. The roll units are superimposed upon each other with a bran bolter below the second break unit and a flour bolter located at the bottom of the mill. Each roll unit has a fixed roll and a spring-loaded adjustable roll. Four wheat samples of 100 g. or less may be milled at one time."

3225 Black, H. C., Fisher, M. H. & Irvine, G. N.
Laboratory milling. I. A small-scale bran finisher.
Cereal Chem. 1961 : **38** : 97–101.

A description is given of a finisher for reclaiming from the bran the 1–3% of flour normally lost in laboratory milling. The equipment has been used at the Grain Research Laboratory, Winnipeg, for determining the milling quality of varieties.

3226 Jakubciner, M. M.
(**New wheat species**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 29–41. [Russian].

[Cf. XXX, 2479].

3227 Yamashita, K. & Tanaka, M.
Some aspects of regarding the collected materials of *Triticum* and *Aegilops* from the eastern Mediterranean countries. I.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 24–30.

Information is provided on the following aspects of *Aegilops mutica*; distribution, flowering habit, variation in floral characteristics, seed fertility

and B-chromosome frequency. *Ae. speltoides*, *Ae. aucheri*, *Ae. longissima* and *Ae. bicornis*, four species of the section *Sitopsis*, were found in various countries of the eastern Mediterranean area, as were *Triticum aegilopoides*, *T. monococcum*, *T. thaoudar* and *T. dicoccoides* vars. *kotschyanum* and *spontaneovillosum* [cf. 254].

3228 Lashin, M. H.
Analyse der Ertragsstruktur von Winterweizensorten mit besonderer Berücksichtigung der ertragsbestimmenden Faktoren. (**Analysis of yield structure of winter wheat varieties with special reference to factors determining yield**).
Diss. Landw. Hochsch. Hohenheim : April 1960 : Pp. 132.
Response to different (*a*) nitrogen levels, (*b*) row widths, (*c*) seed rates and (*d*) sowing dates was studied in three varieties differing in stand density and yield per ear. Varietal differences in yield response were greatest for (*b*) followed by (*d*).

3229 Philipp, L.
Variabilitätsstudien am Ertragsaufbau des Sommerweizens. (**Studies of variability of yield composition in spring wheat**).
Z. Acker- u. PflBau. 1960 : **111** : 334–63.
Studies of yield components in 16 varieties over three years, during which spacing, time of sowing and manuring were kept constant, are reported. Numbers of fertile and sterile spikelets per ear were varietal characteristics, the number of sterile spikelets showing the greater environmental variation. Other varietal characters were number of grains per ear and per spikelet and duration of period of ear emergence. Grain weight per ear and 1000-grain weight were variable according to year, and number of ear-bearing culms, although characteristic for each variety, was also variable. It is suggested that number of grains per ear and spikelet would form a satisfactory basis for breeding. Methods of sampling for the different characters are discussed.

3230 Vălčanov, D.
(**Soil preparation and the sowing of wheat on irrigated land**).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 9 : 17–19. [Bulgarian].
Varieties which did not lodge on rich soil under irrigation at Stara Zagora are listed. The Italian varieties Fino, Mara, Abbondanza, San Pastore and Impeto were the most productive and also suitable for combine harvesting.

3231 Heyland, K.-U.
Ein Beitrag zur Methodik der Standfestigkeitsuntersuchung bei Winterweizen mit Hilfe der Knickfestigkeit des Halmes. (**A contribution to methods of investigating lodging resistance in winter wheat using the breaking resistance of the straw**).
Z. Acker- u. PflBau. 1960 : **111** : 321–33.
When applied to the haulms of 33 German wheats harvested in 1952, 52 harvested in 1957 and 33 in 1958, a simplification of the formula for expressing the carrying capacity of a rod fixed at one end gave values which were closely correlated with lodging resistance, particularly when the varieties were grouped according to their maturity period. A high carrying capacity and low lodging resistance never occurred together, although the reverse was occasionally observed. Year to year correlations were good, the varieties falling into much the same order in different years. This suggests that, in conjunction with the use of standard varieties, the determination of carrying capacity may prove useful in selecting for lodging resistance dependent on straw characters. Simple methods for determining the factors required for the calculation of carrying capacity, viz. weight per unit length of the straw base, length of straw including ear, and weight of ear, are described.

3232 Rod, J.
Geneticko-fyziologická studie rezistence pšenic proti sněti prašné. VI. Úloha umělých infekcí ve šlechtění. (**A genetical and physiological study of the resistance of wheat to loose smut. VI. The problem of artificial infection in breeding**).
Sborn. čsl. Akad. zeměd. Ved : Řada rostlinná Výroba 1960 : **33** : 1589–608.
Seventeen lines of two susceptible varieties were injected with an aqueous suspension of spores and observations made on the fungal attacks suffered by the progenies of these lines. It was found that the genetically determined resistance of the progeny was not noticeably affected by the infection of the parents.

3233 Schuhmann, G.
Weitere Untersuchungen zur Rassenspecialisierung des Zwergsteinbrandes und Ergebnisse der Resistenzprüfung. (**Further investigations on racial specialization of dwarf bunt and results of resistance testing**).
Prakt. Bl. PflBau 1960 : **55** : 56–59.
Wheat varieties were tested with samples of the pathogen from different districts in southern

Germany and two types of bunt differing in aggressiveness were distinguished. The varieties Martin, Relief, Hussar and Wasatch were most resistant. In another test with the less aggressive type of bunt, the German variety Marquardts II was not attacked. Other varieties of different species were also unattacked.

3234 WAGNER, F.
Ergebnisse von Infektionsversuchen mit verschiedenen Zwergbrandherkünften 1957 und 1958. (**Results of infection experiments with different sources of dwarf bunt 1957 and 1958**).
Prakt. Bl. PflBau 1960 : **55** : 60–61.

No physiological races of dwarf bunt were distinguished in Bavaria but samples from different regions varied in aggressiveness on the wheats tested.

3235 KENDRICK, E. L. & HOLTON, C. S.
Racial population dynamics in *Tilletia caries* and *T. foetida* as influenced by wheat varietal populations in the Pacific Northwest.
Plant Dis. Reptr. 1961 : **45** : 5–9.

Surveying the wheat varieties grown in the above region of the USA during 1900–60 and the distribution of bunt races during the same period, it is shown how the least resistant types of host usually allowed the simplest or weakest pathogenic types to prevail, whereas the introduction of more resistant wheats has served to screen out and perpetuate new and more complex pathogenic races.

3236 SCHUHMANN, G.
Zur Frühdiagnose der Steinbrandresistenz. (**The early diagnosis of bunt resistance**).
Prakt. Bl. PflBau 1960 : **55** : 53–55.

Chlorotic flecking of infected seedling leaves was not found to be a reliable indication of susceptibility to *Tilletia contraversa* [cf. XXIX, 3713]. Observing the extent of mycelial growth in stained coleoptile cells is a promising method of determining susceptibility but further tests are needed to ascertain its reliability.

3237 SPASIĆ, M. & MILADINOVIĆ, N.
Otpornost nekih sorti ozime pšenice prema populaciji rasa *Puccinia graminis* iz istočne i jugoistočne Srbije. (**The resistance of some varieties of winter wheat to a population of races of *P. graminis* from eastern and south-eastern Serbia**).
Arh. poljopr. Nauk. 1960 : **13** : No. 39 : 46–53.

Local and imported varieties of *Triticum vulgare*, *T. durum* and *T. turgidum* were tested for resistance to *P. graminis* f. sp. *tritici*. No immune or highly resistant varieties were found but, among *T. vulgare* types, moderate resistance was shown by strain 159 from Bulgaria, Chinese 166 x Lin Calel from England and Elia, Verna and Est Mottin from Italy. *T. durum* 'Dunavka', a local variety, was also moderately resistant.

3238 LUK'JANENKO, P. P.
(**Methods and results of breeding winter wheat in the Kuban'**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 38–46. [Russian].

[Cf. XXVI, 2239].

3239 KATARKI, B. H.
Promising rust-resistant strains of wheat for Mysore state.
Mysore agric. J. 1960 : **35** : 53–59.

Tabulated data are provided on the agronomic and morphological characters of thirteen hybrids, the best of a number of stem-rust resistant wheats developed by crossing Gaza with high-yielding local varieties [cf. XXIX, 3721].

3240 MCGINNIS, R. C. & CAMPBELL, A. B.
Differential inheritance in crosses involving three phenotypically similar wheat varieties with Redman monosomics.
Canad. J. Genet. Cyt. 1961 : **3** : 10–12.

In an earlier investigation of crosses of monosomics of Redman with Prelude (Downy Gehun x Fraser), the authors found that Redman had three complementary dominant genes for resistance to race 56 of stem rust, respectively situated on chromosomes III, VIII and XIII; the presence of two complementary dominant genes for awn suppression, one on IX and the other on XVII, was also detected [XXIX, 2524]. Further work has been carried out to determine whether similar conclusions would have been reached had a variety other than Prelude been used as the stem-rust susceptible, awned parent. Monosomics III, VIII, IX, XIII and XVIII of Redman were crossed with Canus (Kanred x Marquis) and Huron (White Fife x Ladoga). The crosses with Canus indicated that Redman had two dominant complementary genes for stem-rust resistance on VIII and XIII, and a dominant gene for awn suppression on IX. According to data from the crosses with Huron, Redman had a dominant gene for stem-rust resistance on each of chromosomes III, VIII and XIII, and one dominant gene

for awn suppression on IX. The study thus demonstrated how complementary gene systems may cause apparent discrepancies.

3241 Ellingboe, A. H.
Somatic recombination in *Puccinia graminis* var. *tritici*.
Phytopathology 1961 : **51** : 13–15.

Recombinants were obtained when uredospores of one culture were mixed with each of six others and inoculated into four wheat varieties. Recombinants were identified on the basis of a change to pathogenicity, together with red spore colour, which was dominant to orange or grey brown. The recombinants were increased on Little Club; each was subsequently inoculated into a series of 54 varieties of wheat. A total of 57 distinct recombinants was obtained from the six two-culture mixtures. The high frequency of progeny with greater virulence than the parental cultures was noteworthy. The variety on which the recombinants originally occurred appeared to exert a qualitative selective effect on the pathogenicity of the recombinants recovered. In the case of two of the mixtures, the origin of the recombinants could be attributed to reassortment of whole nuclei. The occurrence of the variants derived from the other four mixtures could not be explained in this manner. The question of whether parasexuality or a meiotic process in the somatic tissue was operative cannot however be decided without genetic analysis of the isolates by means of the standard sexual cycle and an understanding of the mode of inheritance of pathogenicity. Evidence was obtained that more than one locus may be involved in pathogenicity and that the different loci govern different types of the host-parasite reaction.

3242 Knott, D. R.
The inheritance of rust resistance. VI. The transfer of stem rust resistance from *Agropyron elongatum* to common wheat.
Canad. J. Pl. Sci. 1961 : **41** : 109–123.

"The rust resistance of a 56-chromosome wheat-*Agropyron* derivative was found to be controlled by a gene or genes on a single *Agropyron* chromosome. Resistant wheat plants having 21_{II} of wheat chromosomes plus a single added *Agropyron* chromosome were produced. Spikes of these plants were irradiated with either gamma rays or X-rays and seeds were irradiated with thermal neutrons. As a result of the irradiation, in at least five lines and possibly seven a piece of the *Agropyron* chromosome carrying the gene or genes for rust resistance was transferred to a wheat chromosome. One of the translocations is transmitted normally through the gametes but the remaining six show irregularities in transmission particularly through the pollen." [Author's summary].

3243 Knott, D. R.
Attempts to produce rust resistant mutants in wheat by irradiation.
Canad. J. Genet. Cyt. 1961 : **3** : 20–22.

Treatment of seeds of Thatcher with X-rays failed to induce any mutants resistant to stem or leaf rust at the University of Saskatchewan. Seeds of Stewart (*Triticum durum*) were exposed to thermal neutrons. One apparent mutant for stem-rust resistance was obtained in the N_2, but it carried the gene for resistance found in Golden Ball and was therefore probably the result of an outcross.

3244 Ogilvie, L. & Thorpe, I. G.
New light on epidemics of black stem rust of wheat.
Sci. Progr. Lond. 1961 : **49** : 209–27.

First giving an historical account of stem-rust infection in Europe and North America and of early work on the pathogen, the authors survey recent investigations in western Europe dealing with race identification and with the role of such factors as *Berberis*, overwintering of uredospores and transference of spores by air currents in causing epidemics. A brief consideration of the impact of growing resistant wheat varieties upon the frequency of epidemics and upon the race situation is included.

3245 Muszyńska, K.
Badania nad rdzą brunatną pszenicy w Polsce (*Puccinia triticina* Erikss.). [**Studies of brown rust of wheat in Poland (*P. triticina* Erikss.)**].
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 149–66.

Details are given of the brown-rust reactions of 147 varieties tested at two Polish stations during 1955–58. Races 52, 61, 114, 126 and 129 have been distinguished in Polish material. Breeding for resistance is in progress.

3246 Johnson, T.
Man-guided evolution in plant rusts.
Science 1961 : **133** : 357–62.

Mainly with reference to stem rust of wheat, the author analyses the impact of the development of resistant varieties during the past few decades upon the evolution of the fungus in North America and other regions, the genetics of the interaction between host and pathogen and the possible modes of origin of new pathogenic

types being among the aspects surveyed and discussed.

3247 Lin, K.-M. & Tseng, C.-J.
Preliminary report on wheat breeding for rust resistance in Taiwan.
Bot. Bull. Acad. sin. 1960 : **1** : 157–63.
The following wheat varieties showed high resistance to *Puccinia rubigo-vera* var. *tritici* and *P. graminis* in trials conducted in 1952–53 in the Taichung area of Formosa; Selkirk, Towner, Yuma, Timstein x Newthatch, Frontana x Thatcher, HsH_v4603 and SH_vS607. A number of varieties, which showed resistance to leaf rust in the midwestern part of the USA, proved susceptible in Taichung; this suggests that certain physiological races of leaf rust are present in Taichung but are absent in midwestern USA. A breeding programme, involving Timstein x Newthatch and two local varieties, Taichung 31 and Taichung 32, was begun in 1953. Four early-maturing, rust-resistant Taichung lines, 137(a), 138(a), 140(a) and 141(a), have now been selected. In trials conducted at five centres in Taichung in 1959, these selections gave higher yields than local commercial varieties.
Inheritance studies indicated that resistance to leaf rust is governed by a single pair of dominant genes while resistance to stem rust is controlled by a single pair of recessive genes.

3248 Singh, M. P. & Swaminathan, M. S.
Monosomic analysis in wheat V. Identification of chromosomes carrying genes for resistance to two races of stem rust in the variety N.P. 790.
Indian J. Genet. 1960 : **20** : 160–65.
From crosses with the monosomic set of Chinese Spring it is concluded that the resistance of NP790 to stem rust race 15c is conditioned by two recessive duplicate genes located on chromosomes 1A and 2A; an excess of resistant seedlings in the F_2 of crosses involving lines monosomic for these chromosomes is attributed to gene-dosage effects. Resistance to race 21 is conditioned by a single recessive gene located on chromosome 3D. [Cf. 1703].

3249 Rao, M. V. & Agrawal, R. K.
Inheritance studies in wheat—VII. Inheritance of seedling reaction to physiologic races 24 and 117 of *Puccinia graminis tritici* in some intervarietal crosses of common bread wheat.
Indian J. Genet. 1960 : **20** : 184–87.
The data from these crosses indicate that E1913 [(Kenya-Gular-Pilot) x (K58–New Thatch)] carries three dominant duplicate genes for resistance to race 24 while NP790 and Ridley (E572) each carry two duplicate dominant genes. E871 (Timstein x 2086 Sel.1495A–1–7–3–1) has only one dominant gene for resistance to this race. Resistance to race 117 is governed by three dominant duplicate genes in E1913 and by two pairs of dominant duplicate genes in both E572 and NP790. A single dominant gene confers resistance in E871. [Cf. 1776].

3250 Birnie, G.
Rust-resistance in some induced mutations of the new Pusa wheats 797, 798 and 799.
Euphytica, Wageningen 1960 : **9** : 290–92.
With the aim of inducing the awned character, the above wheats were treated with various mutagens. The awned mutants were equal to the initial varieties in resistance to different races of black and brown rust. Mutant 1–4–5 from NP797 was also highly resistant to brown-rust races 10, 20 and 63, to which NP797 is susceptible; the seedlings produced on selfing 1–4–5 showed the same rust reaction as their parent.

3251 Kădrov, T.
(The connexion between the effect produced by drying winds on wheat and its infection with rust).
Selskostopan. Misăl 1959 : No. 10 : 787–88. [Bulgarian].
The infection of wheats with *Puccinia triticina* was aggravated when the plants had been previously subjected to drying winds in Bulgarian experiments. Tolbuhin 10, 301 and IZR408 showed a higher degree of resistance to the joint effects of drought and infection than Jubilejna 11 [Jubilee 11] and some other varieties.

3252 Miller, C. W. & Hart, H.
Temperature and light trigger rust infection.
Crops & Soils 1961 : **13** : No. 4 : 23–24.
The influence of light and temperature on the pathogenicity of four races of stem rust on Kubanka wheat was studied. At 1500 foot candles and 85° F., all races developed spores on most of the seedlings tested, while at 100 foot candles and 65–80° F., very few spores were produced. It appeared that the pathogenicity of each race was highest under specific light and temperature conditions. The possible utilization of this and similar information in the testing of varietal resistance to rust and in

the identification of stem-rust races is mentioned briefly.

3253 Doling, D. A. & Batts, C. C. V.
Effect of previous cropping on eyespot and take-all in four varieties of winter wheat.
Plant Path. 1960 : **9** : 115–18.

Data on the incidence of eyespot (*Cercosporella herpotrichoides*) and take all (*Ophiobolus graminis*) on Bersée, Hybrid 46, Cappelle Desprez and Juliana, obtained during 1954–57 at the Norfolk Agricultural Station, are reported. Cappelle Desprez was the least affected variety and produced the highest yield of grain.

3254 Miller, B. S., Robinson, R. J., Johnson, J. A., Jones, E. T. & Ponnaiya, B. W. X.
Studies on the relation between silica in wheat plants and resistance to hessian fly attack.
J. econ. Ent. 1960 : **53** : 995–99.

The leaf sheaths of wheat varieties and the oat Cimarron, possessing resistance to Hessian fly (*Phytophaga destructor*), had a much more complete and even distribution of silica deposits, usually round to oblong in shape, on their surface than the leaf sheaths of susceptible wheat varieties. The deposits in the latter varieties were rod-shaped masses arranged in dispersed rows. Density of deposition depended on the physiological age of the plants, a factor which should therefore be considered in studying the problem of resistance. Four wheats, three susceptible and one resistant, had silicified hairs on the leaf sheath. The relationship of such hairs with reaction to the pest in unknown. From a study of barley varieties no conclusions could be drawn concerning the relationship of silica deposits with degree of resistance.

3255 Pascale, A. J.
Características bioclimáticas de cuatro híbridos de trigo de la Facultad de Agronomía y Veterinaria. (**Bioclimatic characteristics of four wheat hybrids of the Faculty of Agronomy and Veterinary Science**).
Rev. Fac. Agron. B. Aires. 1959 : **14** : 474–98.

The response of four hybrid wheat lines to variations in temperature and day length was investigated. Two lines appeared to be virtually indifferent to day length and did not require a cold period for full development. Dependence upon both factors was noted in the case of the other two lines.

3256 Mochizuki, A.
A note on the B-chromosomes in natural populations of *Aegilops mutica* Boiss. in central Turkey.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : p. 31.

Varying numbers of B chromosomes were found in 55 out of 421 plants growing in Kyoto and Sasayama, Japan. These plants were derived from material collected by the Botanical Mission of the University of Kyoto in central Turkey. The B chromosomes were euchromatic and possessed a median centromere [cf. XXVIII, 348]. In one plant a deficient type of B chromosome was observed. This deviant was telocentric and formed a heteromorphic pair with a standard B chromosome.

BUCKWHEAT

3257 Žebrak, È. A.
[**Using the histochemical method for the study of legitimate and illegitimate pollination in buckwheat (*Fagopyrum esculentum* Moench.)**].
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **135** : 204–06. [Russian].

Comparative analyses of the pistils in legitimately and illegitimately pollinated flowers by the above method showed that in the former the pollen tubes utilized fats and sugars at a higher rate and the pistils were characterized by higher peroxidase activity and increased synthesis of ascorbic acid.

OATS

3258 Haver, 1961. (**Oats, 1961**).
Landbouwvoorlichting 1960 : **17** : Bijl. 76; Ber. Rassenkeuze No. 293 : Pp. 4.

Data on yield and notes on other characters are presented for 25 varieties tested in the Netherlands since 1950. CIV1688, a short, stiff-strawed variety which has yielded well on clay soils, has been admitted to the official varietal list.

3259 Wheat, J. G. & Frey, K. J.
Number of lines needed in oat-variety purification.
Agron. J. 1961 : **53** : 39–41.

To determine whether physiological strains occur within a variety, trials were carried out in Iowa to test the yielding ability of 24 morphologically similar lines of each of the varieties Mo. 0–205, Clintland and Bonham, the lines being derived from individual panicles. The lines of each

variety were also tested as composites of 3, 6, 12 and 24 lines, and as a composite of the 24 and 75 other lines of the same variety. In Clintland and Mo. 0–205, the mean yields of the lines did not differ significantly at any site or when the data for different sites were combined. The yield of one line of Bonham was below that of the other 23 lines of this variety, in all localities, but composites of 3, 6 or 12 lines including this particular line yielded only 0·3 to 0·5 less than the original seed. The entries x sites interaction variance was significant in 2 out of 21 cases, that is, it was of the order to be expected by chance. Furthermore, the entries x sites interaction variance did not show any trend to become smaller as the number of lines in the composites increased. It was therefore concluded that the breeder need not select several hundred panicles when repurifying an oat variety.

3260 Krull, C. F.
Genetic variability in oats following hybridization and radiation.
Diss. Abstr. 1960 : **21** : LC Card Mic. 60–2874 : p. 413. (Abst.).

The material studied was derived from (1) seeds of Clintland and Beedee and from F_2 seeds of Clintland x Beedee, which had been treated with thermal neutrons, and (2) the corresponding control seeds. Three quantitatively inherited characters, viz. heading date, height and 100-seed weight, were investigated. Variance analyses indicated that irradiation increased the variance both between and within families originating from the two parent varieties and their hybrid. Radiation induced about 50% as much variability as hybridization, whether the variability was expressed by mean squares or variance components. Irradiating the hybrid seed increased the variability in 100-seed weight and height over that found in the control hybrids, but variability in heading date was not increased by the treatment. The variability induced by radiation was as heritable as that resulting from hybridization. No consistent positive or negative shifts in skewness were brought about by irradiation, suggesting that equal numbers of beneficial and detrimental mutations were induced. Consistent positive shifts in kurtosis occurred in all three characters.

3261 Walkden Brown, C. & Fitzsimmons, R. W.
Oat varieties for 1961.
Agric. Gaz. NSW 1960 : **71** : 629–38.

An improved form of the late-maturing variety Algerian has been developed. As compared with the older form, the new line is characterized by more erect growth in the early stages, better tillering, wider leaves, greater suitability for grazing at all stages and superior recovery for grain production after heavy grazing. The straw is tall, fine and very weak; it produces hay of excellent quality.
Twelve other varieties, recommended for cultivation in various parts of New South Wales, are described.

3262 Rothman, P. G.
Host-parasite interactions of eight varieties of oats infected with race 202 of *Puccinia coronata* var. *avenae*.
Phytopathology 1960 : **50** : 914–18.

The effects of *P. coronata* var. *avenae* on the leaf tissues of eight oat varieties are described. The varieties are classified into four groups on the basis of differences in varietal response to the pathogen.

3263 **New winter oat gains wide acceptance.**
Crops & Soils 1961 : **13** : No. 4 : p. 18.

Norline, a new winter-hardy variety developed from Lee, Victoria and Forkedeer at Purdue University, has given satisfactory yields in many areas, particularly in New Jersey and south-eastern Pennsylvania. The variety is resistant to some races of crown rust; it is more resistant to yellow-dwarf virus than any other hardy variety in Indiana. Norline is slightly taller than Dubois but has good straw quality.

3264 **Rust-resistant Dodge is new Wisconsin oat.**
Crops & Soils 1961 : **13** : No. 5 : p. 18.

Dodge is a stiff-strawed variety of medium height which ripens at the same time as Clintland; grain quality is high. The variety is highly resistant to crown rust, including race 290, and also to stem rust races 7, 7A and 8; it is susceptible to yellow dwarf and slightly susceptible to smut. Dodge was selected at the University of Wisconsin from crosses involving Hawkeye, Victoria, Garry and Clintland.

3265 Curtis, B. C., Schlehuber, A. M. & Oswalt, R. M.
Tonka oats.
Bull. Okla. agric. Exp. Sta. 1960 : No. B–566 : Pp. 7.

Tonka, which is here described, has shown considerable resistance to barley yellow dwarf virus [cf. XXX, 2567].

3266 Borkovskaja, V. A.
(Prospects of growing winter oats in the North Caucasus).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 87–100. [Russian].

Investigations have been in progress since 1938 on 44 varieties from the world collection. One of the results is the production of Kabardinec [Kabarda oat] by selection from material sown repeatedly in the autumn and several others produced in the same way are mentioned; they ripen sooner than spring oats and exceed them in grain yield. Introduction 9885 from England was distinguished by the greatest strength of straw and in years where lodging was severe it exceeded others in yield. It was possible to get one and sometimes two cuts of hay without materially reducing the yield of grain below that of spring oats.
The ear primordia of the winter oats remained undeveloped over the winter, as in winter wheats, though in winter hardiness the oats were much inferior to the wheats.

3267 Frey, K. J. & Rodgers, P.
Yield components in oats. V. Optimum number of replicates and samples per plot for spikelet counts.
Agron. J. 1961 : **53** : 28–29.

According to the results of an analysis of six varieties conducted at the Iowa Agricultural Experiment Station to determine how to measure spikelet number per panicle at minimum cost, the most efficient numbers of replicates and samples per plot to obtain a precision of $\sigma^2_{\bar{x}} = \cdot 08\bar{x}$ were respectively 7 and 6. If the plots were used for measuring spikelet number and two other yield components, the most efficient numbers of replicates and samples per plot for determining spikelet number were respectively estimated to be 9 and 4. [Cf. XXX, 2569].

3268 Popović, A. O.
Povećanje prinosa ovsa sortiranjem semena i jarovizacijom. **(Increasing the yield of oats by seed grading and vernalization).**
Savremen. Poljopr., Novi Sad 1959 : **7** : 212–19.

Seed grain of the variety 13–75 was separated into four size categories. In subsequent field trials, substantially higher grain yields were obtained from the larger-sized seeds (> 2·0 mm. diameter) than from smaller seeds.
Vernalization of the seed of Eaton, 12–1 and 245 also led to increased yields. Plants derived from vernalized seed germinated, headed and matured 3–5 days earlier than nonvernalized controls.

3269 **Winter oats are moving north.**
Agric. Res., Wash. 1961 : **9** : No. 7 : 3–4.

As the result of recent breeding for hardiness, cultivation of winter oats in the USA further north than at present is considered feasible. Speedier progress in this project may be expected by two developments: (1) expansion and improvement in facilities for artificial testing to shorten the period of field testing, and (2) increase in basic research into the physico-chemical changes underlying hardening.

3270 Ikenberry, G. J. (Jun.) & Young, H. C. (Jun.).
A leaf blight of Cimarron oats.
Phytopathology 1961 : **51** : 80–83.

A leaf blight peculiar to Cimarron and derivatives of Cimarron x Traveler, designated Cimarron blight, is probably a genetically controlled physiological breakdown of leaf tissues, although expression of the disorder may be influenced by the environment. Observations on F_2 Cimarron x Traveler indicated that resistance was incompletely dominant. More than one gene was evidently involved but the data failed to fit any known genetic ratio.

3271 Upadhyaya, Y. M. & Baker, E. P.
Studies on the mode of inheritance of Hajira type stem rust resistance and Victoria type crown rust resistance as exhibited in crosses involving the oat variety Garry.
Proc. Linn. Soc. NSW 1960 : **85** : 157–79.

"Studies on the mode of inheritance of stem rust and crown rust resistance to certain races of the pathogens in crosses involving the resistant oat variety Garry and various susceptible varieties showed that Garry comprised a heterogeneous mixture of genotypes. Three factor pairs conditioning stem rust resistance were identified, designated as Rd_1, an independent gene operative against races 2 and 12, and the linked genes Hj_1 and Hj_2 (with a recombination value of 26·69 $\pm$ 2·29 crossover units) conditioning seedling resistance to races 2, 10 and 12 and field inoculum. In all, six factor pairs were concerned with crown rust resistance and these were in three linkage groups. Group 1 comprised three genes with the following estimated linkage values: $\frac{Vc_a \qquad Vc_b \qquad V\bar{c}_1}{9{\cdot}59 \pm 1{\cdot}68 \quad 10 \text{ approx.}}$.
Vc_a and Vc_b were complementary genes for seedling resistance, whilst $V\bar{c}_1$ conditioned adult

plant resistance only. Linkage group 2 comprised the two genes Vc_2 and IVc_2 with an estimated recombination value of 10 crossover units between them. Vc_2 conditioned seedling as well as adult plant resistance, but was inhibited by IVc_2. Thirdly, Vc_3 was an independent dominant gene for adult plant resistance only. The genes conditioning stem rust resistance were genetically independent of those for crown rust resistance."

[Authors' summary].

3272 Green, G. J., Johnson, T. & Welsh, J. N.
Physiologic specialization in oat stem rust in Canada from 1944 to 1959.
Canad. J. Pl. Sci. 1961 : **41** : 153–65.

A detailed account is given of the physiologic specialization and geographical distribution of *Puccinia graminis* f. sp. *avenae* in Canada [cf. XV, 452]. Sources of resistance to the disease and the origin of new races of the pathogen are discussed. The variety CI4023 (Hajira x Joanette) has shown a high degree of resistance to a number of virulent races, including 6, 6A, 7, 7A, 8A and 11A.

3273 **Crown rust found in few Illinois fields of Goodfield oats.**
Crops & Soils 1960 : **13** : No. 3 : p. 30.

A new virulent subrace of race 290 is apparently responsible for the presence of *Puccinia coronata* in Goodfield oats. During 1960, Portage was the variety least attacked by crown rust in Wisconsin.

3274 Marshall, H. G. & Myers, W. M.
A cytogenetic study of certain interspecific *Avena* hybrids and the inheritance of resistance in diploid and tetraploid varieties to races of crown rust.
Crop Sci. 1961 : **1** : 29–34.

The number of genes conditioning resistance to crown rust races 276, 203 and 216 was determined in six *A. strigosa* varieties (diploid) and in *A. abyssinica* 'PI193958' (tetraploid). Resistance to race 276 was conditioned by 2 independent dominant genes in CI4639, CI3815, CI2524 and Ceirch Llwyd [Grey oats], by 1 dominant gene in CI2835 and CI4746, and by 1 partially dominant gene in the *A. abyssinica* strain. Resistance to race 203 is thought to be controlled by 1 dominant and 1 recessive gene in CI4639 and by 1 dominant gene in all other varieties; in CI2835, CI4746 and *A. abyssinica*, dominance was incomplete. Resistance to race 216 was conditioned by 2 dominant genes in CI4639 and CI3815, by 1 dominant gene in the other *A. strigosa* strains and by a single recessive gene in *A. abyssinica*.

The possibility is considered that the dominant gene conditioning resistance to race 203 in the diploids may be the same as or closely linked with the gene or genes conditioning resistance to races 216 and 276. There was no indication of linkage between the crown-rust resistance genes and the single dominant gene conditioning pubescence of the lower leaf sheath.

F_1 hybrids were obtained from *A. abyssinica* x *A. strigosa*, *A. strigosa* x *A. sativa* (hexaploid), *A. abyssinica* x *A. sativa* and autotetraploid *A. strigosa* x *A. sativa*. Out of 16 F_2, BC_1, and BC_2 individuals from the last cross, only 2 did not possess the crown rust resistance of the *A. strigosa* parent. No viable self-pollinated or back-crossed seed was obtained from the other hybrids. Meiosis was extremely irregular in all the hybrids.

Observations on chromosome pairing suggest that *A. abyssinica* carries two partially homologous genomes which are also partially homologous with that of the diploid *A. strigosa*. It is thought that *A. sativa* may have one genome homologous with that of *A. strigosa* although other possibilities are considered. *A. sativa* and *A. abyssinica* may have one genome in common or several that are partially homologous; a low average number of bivalents indicates a low homology between the genomes of these two species. Bivalents of the triploid hybrids were frequently of the ring type while those of the tetraploid and pentaploid hybrids were of the rod type. Bivalents of the *A. strigosa* autotetraploid x *A. sativa* hybrids tended to be of the ring type, indicating pairing among *A. strigosa* chromosomes; little inter- or intragenomic pairing appeared to occur among *A. sativa* chromosomes.

3275 Marshall, H. G. & Schein, R. D.
Occurrence of snow mold, *Typhula itoana* Imai, on winter oats in Pennsylvania.
Plant Dis. Reptr. 1960 : **44** : 894–900.

Information is given on the survival of winter-oat varieties and advanced-generation lines under conditions of attack by *T. itoana* in a yield trial in Clearfield County, Pa., during 1959–60. CI7480 (Wintok selection x Hairy Culberson) showed most survival (90%), followed by CI7502 (same parentage as CI7480), Bronco, LeConte, CI7132 ([Trav. x (RR x V–R)] x [Fulwin–Wintok]) and CI6904 [(Lee–Victoria) x Forkedeer], all with 80% survival.

3276 French, N. & Cairns, R. S.
A new spring oat variety resistant to stem and bulb eelworm.
Plant Path. 1960 : **9** : p. 129.
In a 4-variety trial in Durham, Manod [Cf. XXX, 2443] showed marked resistance to *Ditylenchus dipsaci*.

RYE

3277 Nečas, J.
(The inheritance of branched ear in rye accompanied by increased number of flowers and flower parts).
Biol. Plant., Praha 1961 : **3** : 65–74. [Russian].
The branched ear character was found to be conditioned by a single recessive gene in the variety Dobřenické trsnaté [Tillering Dobřenice].

3278 Rod, J. & Andonov, I.
Použití meziodrůdové heteróze s "větevnatým" žitem pro zvyšování produkce zelené hmoty. **(Using intervarietal heterosis with branched rye for increasing the production of green matter).**
Sborn. čsl. Akad. zeměd. Ved : Řada rostlinná Výroba 1961 : **34** : 187–94.
Branched rye was crossed with 10 other varieties and some of the F_1 progenies showed heterosis in grain and green-matter production.

3279 Kojnov, G.
(Heterosis in rye, an important reserve for increasing its yield).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 9 : 34–35. [Bulgarian].
The "heterotic" varieties Kolarov 1 and Kolarov 2 were obtained by intervarietal hybridization using Petkus, 019, 59 and 362 as initial material at the Kolarov institute in Plovdiv. The growth and flowering periods of the new varieties coincide with those of Petkus and 59. Mention is also made of the varieties S2 and Niskostäblena [Short-stemmed] which were bred by hybridization at Sadovo.

3280 Borojević, S.
Analiza ukrštanja tetraploidnih sorti raži. **(An analysis of crosses of tetraploid rye varieties).**
Savremen. Poljopr., Novi Sad 1959 : **7** : 116–20.
F_1 plants derived from a cross between tetraploid strains of Stålråg [Steel rye] and Petkus were compared with plants of the parent varieties in a trial at Zagreb. Although the F_1 was superior to the better parent in stalk height, number of kernels per ear and thousand-kernel weight, in no cases were the differences significant. In most other characters studied, the F_1 was similar to the better parent, but in tillering capacity F_1 plants were inferior to either parent. It is suggested that lack of genetic diversity between the two varieties accounts for the absence of more pronounced hybrid vigour.

3281 Stroun, M., Mathon, C. C. & Pugnat, C.
Transformation de Seigle d'automne (*Secale cereale*) en Seigle de printemps à la suite d'une modification des conditions de vernalisation. [**The transformation of winter rye (*S. cereale*) into spring rye as a result of a modification of the conditions of vernalization**].
Ber. Schweiz. bot. Ges. 1960 : **70** : 440–47.
Altering the temperature conditions during a given stage of development transformed winter rye into spring rye; both spring and winter plants can be obtained amongst the progeny of a single individual.

3282 Antropova, V. F.
(Rye as forage).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 53–86. [Russian].
An account is given of the use of rye as fodder in different countries of the world, indications being given of the best varieties for this purpose. Examinations have been made of cultivars from a number of different areas within the Soviet Union. Some forms produced as many as 40 mature tillers under normal conditions of spacing, where the common cultivars formed 2–8 only; *Secale kuprijanovii* and *S. montanum* formed up to 200. The proportion of leaves varied, reaching a maximum of 32% in Čitinskaja rye. Some cultivars, such as Vjatka and Ivanovskaja, reduced their leaf size in the second cut less than others. Varieties with pale green leaves had a higher content of protein and carotene than those, such as diploid and tetraploid Petkus, with dark green leaves. The thinnest stems were found in Siberian ryes, while those from northern Russia had the tallest straw and longest ears. Varieties differed in their degree of recovery after mowing, capacity to come into ear when sown in spring, yield of green matter and content of dry matter, carotene, protein, vitamins and other constituents; also in the degree to which their grain yield was reduced by mowing. Hybrids of *S. kuprijanovii* x *S. cereale* exceeded the

latter parent in yield of green matter by 4·0–45·1%, were more cold resistant and had stronger straw. Those varieties that gave the best combined yields of green fodder and grain are listed. They include certain standard varieties such as Vjatka, several land races from different parts of the Soviet Union, certain varieties introduced from Germany and elsewhere, and several hybrids from *S. kuprijanovii* and *S. montanum*. Certain other types, particularly the small-grained group, are considered suitable for fodder only.

3283 Loch, L.
Ein Beitrag zur Standfestigkeitsuntersuchung, dargestellt an diploidem und tetraploidem Saatroggen (*Secale cereale* L.). [**A contribution to the study of standing ability, based on diploid and tetraploid rye (*S. cereale* L.)**].
Z. Pflanzenz. 1960 : **44** : 217–42.

The internal and external factors affecting resistance to lodging are considered and two methods of testing the resistance are described. When the supporting power of seedlings was measured, significant differences were found between diploid and tetraploid rye. The length and thickness of the coleoptile and the length of the seedling were found to have a relatively small effect on the supporting power; the greater strength of the tetraploids appeared to be related to the relatively greater size of the embryo in the grain. A modification of the straw dynamometer method also gave significantly different readings for diploid and tetraploid rye and is thought to be suitable for judging mechanical resistance to lodging. Erect forms of tetraploid rye showed greater resistance than forms with a bending ear at the yellow stage of ripeness.

MAIZE

3284 Schmidt, J.
Vyhodnocení odrůd a hybridů kukuřice na zrno podle výsledků srovnávacích odrůdových pokusů za leta 1954–1957. (**An analysis of varieties and hybrids of grain maize from results of comparative varietal tests for the years 1954–57**).
Sborn. čsl. Akad. zeměd. Ved : Řada rostlinná Výroba 1961 : **34** : 159–86.

The results are reported of trials held in parts of Czechoslovakia and varieties are recommended for different regions.

3285 Snijmais, 1961. (**Fodder maize, 1961**).
Landbouwvoorlichting 1961 : **18** : Bijl. 88; Ber. Rassenkeuze No. 305 : Pp. 3.

Details of earliness, straw stiffness, height, fresh weight, and content and yield of dry matter are given for eight varieties tested in the Netherlands.

3286 Ivleva, L. A.
(**Maize in the Hanty-Mansijskij National Region**).
Kukuruza (Maize) 1959 : No. 10 : 32–33. [Russian].

The hybrid population Krasnodar 1/49 and the variety Voronež 76 yielded more forage than all other varieties and hybrids in the above region where the growth period is limited to 134 days by frost in spring and autumn.

3287 Thitathan, P.
(**Research work on maize in Siam**).
Kasikor (Farmer)/Kasikorn Bangkok 1955 : **28** : 345–51. [Siamese].

Trials of 21 varieties, of which 20 were imported, showed the best to be Tiquisate Golden Yellow (C110) and selection 142–48 (C111) from Guatemala and the local yellow dent variety from Tup Kwang (C113). Grain quality was highest in the local variety but the foreign varieties gave higher yields.

Reunión Técnica del Maíz, Rosario, Santa Fe, 28–29 agosto 1958. (**Technical Conference on Maize, Rosario, Santa Fe, 28–29 August, 1958**).
Idia 1960 : No. 3 : Suppl. : Pp. 54.

3288 *Rossi, J. C. Frecuencia de caracteres recesivos en poblaciones de maíces colorados duros de la zona de Pergamino.* (*Frequency of recessive characters in populations of flint maize in the Pergamino area*). (*pp. 2–3*).

Wide variations were noted in the incidence of 11 recessive characters in 15 maize populations. Yellow and green lethals were the most frequent recessives observed. Evidence of continued introgression of germ plasm from dent maize was obtained.

3289 *Lázaro, R. C. Posibles causas de heterosis en cruzamientos intervarietales.* (*Possible causes of heterosis in intervarietal crosses*). (*pp. 3–4*).

Higher yields were obtained from Middland x Colorado Klein than from either of the two parent varieties. Possible explanations for the presence of heterosis are discussed [cf. XXV 3020].

3290 *Rossi, J. C. & Petri, F. Influencia de la selección previa a la prueba de aptitud combinatoria.* (*The influence of selection prior to a test of combining ability*). (*pp. 4–5*).
The importance of rigorous selection in the development of new maize lines was demonstrated.

3291 *Rossi, J. C. & Colazo, J. C. Incorporación de esterilidad citoplasmática en líneas flint.* (*Incorporation of cytoplasmic sterility in flint lines*). (*p. 5*).
A dent line of American origin was used to incorporate male sterility into five flint and two dent lines. Hybrids derived from one of the male-sterile flints, CM1, gave higher yields than hybrids derived from normal CM1.

3292 *Videla, R. O. Mejoramiento de maíz en la Estación Experimental Agropecuaria de Bordenave.* (*Maize breeding at Bordenave Agricultural Experiment Station*). (*pp. 5–7*).
In 15-entry yield trials conducted at Bordenave between 1954 and 1958, best results were obtained from a double-cross hybrid H54 (L71 x L232) x (R46 x BX6). A number of other promising hybrids have been bred at the station.

3293 *Lázaro, R. C. & Alaggia, H. Heterosis en cruzamientos "intertipo".* (*Heterosis in "intertype" crosses*). (*pp. 7–8*).
Analysis of the results of a large number of trials showed that dent x dent and flint x dent crosses have a slightly higher yield potential than flint x flint crosses [cf. XXI, 2601 and XXV, 860].

3294 *Rossi, J. C. & Petri, F. Correlación entre altura de planta, longitud y forma de espiga de líneas endocriadas con el rendimiento del híbrido simple.* (*Correlation between plant height and ear length and shape in inbred lines and the yield of the single hybrid*). (*pp. 8–9*).
Observations on the morphological characters of inbred lines and on the yielding ability of a number of single-cross hybrids are reported. Highest yields were obtained from hybrids derived from large-eared inbreds. Hybrids derived from tall inbreds also gave high yields but ear size exercised a greater beneficial effect on yield than plant height. Ear shape had less influence on yield than the other characters studied; the best ear shape combination consisted of a cross between ovoid-eared and conical-eared types.

3295 *Rossi, J. C. Plantas de maíz tipo tallo cuadrado y tipo flecha.* (*Square-stemmed and arrow-shaped maize plants*). (*p. 9*).
Descriptions are given of two self-fertile mutant maize forms, which were originally found in 1948. One mutant appeared in the second-generation progeny of the hybrid Santa Fe 2 and is characterized by reduced height, square stem and opposite and decussate phyllotaxis. Young plants of the other mutant are arrow-like in appearance, as a result of the leaves remaining folded. In the adult stage this mutant has a thin stem and very short, erect leaves.

3296 *Rossi, J. C. & Petri, F. Líneas de buen comportamiento a la podredumbre radicular y de base del tallo, obtenidas en Pergamino.* (*Lines produced at Pergamino with good resistance to root and stem-base rot*). (*pp. 9–10*).
Information is provided on the root development, yield potential and combining ability of eight maize lines showing moderate to very good rot resistance.

3297 *Rosbaco, U. F. Novedades en los métodos de mejoramiento de maíz en los Estados Unidos.* (*Recent developments in the methods of maize breeding in the United States*). (*pp. 10–17*).
Some of the more significant contributions to the principles and practice of maize breeding are discussed in this review.

3298 *Gheorghianov, V. Rendimiento de variedades uruguayas y argentinas durante el año 1957–58 en La Estanzuela (Uruguay).* [*The yield of Uruguayan and Argentine varieties at La Estanzuela (Uruguay) during the year 1957–58*]. (*pp. 26–27*).
The highest-yielding varieties in a 16-entry trial were Pergamino 2, TCCL ANCAP and 2842 ANCAP.

3299 *Grieben, H. Resultado de los ensayos comparativos de rendimientos con maíz durante el quinquenio 1952/53–1956/57; trienio 1954/55–1956/57 y año 1957/58, en las 6 subregiones ecológicas.* (*Results of comparative yield trials of maize in the six ecological subregions during the five-year period 1952–53—1956–57; the three-year period 1954–55—1956–57 and the year 1957–58*). (*pp. 27–35*).
The results of a large number of yield trials in Argentina showed that hybrids were consistently superior to open-pollinated varieties. Semident hybrids performed equally well in all areas, while dent hybrids gave good results only under

optimum edaphic and climatic conditions. The outstanding hybrids were Pergamino 2, Cargill Record 1 and Santa Fe 4, while the best open-pollinated variety was Colorado La Holandesa [Dutch Flint].

3300 *Bragadín, E. A. & Díaz, H. B. Los híbridos comerciales de maíz en Tucumán.* (*Commercial maize hybrids in Tucumán*). (*pp. 35–37*).

A number of varietal trials in the province of Tucumán had to be abandoned owing to severe attacks by *Helminthosporium turcicum* (*Trichometasphaeria turcica*). The only variety which showed some resistance to the disease was Blanca Perla [White Pearl].

3301 *Rosbaco, U. F. Comportamiento de híbridos dobles* (*comerciales*) *y variedades en Tezanos Pinto.* [*The performance of* (*commercial*) *double hybrids and varieties at Tezanos Pinto*]. (*pp. 37–38*).

Santa Fe 4 and Pergamino 2 gave the highest yields in a number of trials conducted at Tezanos Pinto.

3302 Alexander, D. E.
Razmatranja o selekciji kukuruza na sadržaj ulja. (**Observations on the breeding of maize for oil content**).
Hibrid. Kukuruz Jugoslav. 1960 : **3** : No. 12 : 26–33.

Some results obtained in the maize breeding programme at the University of Illinois are discussed [cf. XXVII, 2934 and XXX, 3873].

3303 Caputa, J.
Valeur culturale de quelques variétés de maïs hybrides à ensiler. (**The agricultural value of some maize hybrid varieties for ensilage**).
Rev. rom. Agric. 1960 : **16** : 99–101.

In trials conducted at three Swiss centres in 1959, the outstanding hybrids were Mielmaïs and Ex 22a. The latter, a Swiss selection, showed particularly good resistance to lodging and to low temperatures.

3304 Giesbrecht, J.
Effect of incomplete hills and compensating treatments in comparative corn yield trials.
Canad. J. Pl. Sci. 1961 : **41** : 91–96.

Investigations at the Experimental Farm of the Canada Department of Agriculture, Morden, Man., indicated that the effect of missing hills on the yield of surrounding hills could be compensated for by filling in the missing hills with maize transplants at the 2–3 leaf stage, by sowing maize seeds before the experimental material reached the 4-leaf stage or by sowing sunflower seeds before the experimental maize reached the 5–6 leaf stage.

3305 Giesbrecht, J.
The inheritance of ear height in *Zea mays*.
Canad. J. Genet. Cyt. 1961 : **3** : 26–33.

Application of the partitioning method developed by Powers revealed that two inbreds, V3 and B14, differed by six factors for ear height, two of which controlled number of internodes, the remaining four controlling internode length. These factors did not have any pleiotropic effects. Internode number was not affected by dominance, but heterosis was detected for internode length and the F_1 showed partial dominance for greater ear height. Some interallelic interaction was indicated for all three characters. Heritability estimates averaged 65·5% for internode number, 38·3% for internode length and 82·4% for ear height. Study of ear height on the basis of its two component characters, internode number and length, gave a more accurate analysis of its inheritance than ear height considered as a unit character.

3306 Sowell, W. F., Ohlrogge, A. J. & Nelson, O. E. (Jun.).
Growth and fruiting of compact and Hy normal corn types under a high population stress.
Agron. J. 1961 : **53** : 25–28.

A detailed account of investigations which have already been briefly reported now appears [XXX, 1275].

3307 Gorsline, G. W.
Phenotypic epistasis for ten quantitative characters in maize.
Crop Sci. 1961 : **1** : 55–58.

One double-double cross, six double-cross and six single-cross hybrids were tested for epistatic gene action in respect of the following characters: grain yield and moisture content, percent silk, stalk strength, plant height, ear node height, percent ear node height (ear node/plant height), ear length and diameter and ear length-diameter ratio. Epistasis was established for all ten characters although yield and ear length exhibited fewer instances than did the others. All of the thirteen hybrids exhibited epistasis for five or more characters. Significant epistasis x environment interactions were found for all characters, although epistasis in respect of grain moisture and ear diameter was less subject to environmental influence than was the case with the other eight characters; epistasis x tester interactions were also noted. The validity of

gene action studies based on the assumption of no epistasis is questioned and it is pointed out that wide-base tester inbreds used in top-cross tests may include epistatic as well as additive gene action in their results.

3308 Królikowski, Z. & Borudzki, E.
Obserwacje ważniejszych cech odmian i mieszańców kukurydzy. (**Observations on the most important characters of maize varieties and hybrids**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 111–47.

Details are given of the results of observations on a collection of varieties and hybrids obtained from different parts of Poland and from a number of other countries. A strong correlation was found between the date of flowering and date of maturity and since flowering time is less influenced by weather conditions it was regarded as a better criterion of the vegetation period. On this basis the varieties are arranged into four maturity groups. There was a negative correlation of only $r = 0{\cdot}21$ between time of ripening and height and it was possible to select early types with relatively high yields of green matter.
Dent forms were on the whole more resistant to smut (*Ustilago zeae*) than semidents and flints. Hybrids from the USA and Canada were less susceptible than open-pollinated varieties.
Flints had a higher fat content in the grain than dents.
The time of flowering and other properties of varieties and hybrids obtained from the various countries are compared with those of the Polish forms. Some of the lines from the USSR and Canada are thought to be of value for Polish maize breeding.

3309 Le maïs hybride. (**Hybrid maize**).
Syndicat Agricole, Lille : undated : Pp. 39.

Designed for farmers in northern France, this short pamphlet deals with all aspects of maize cultivation. Particular reference is made to the need to select a variety adapted to local conditions. INRA244, a Franco-American double-cross hybrid, is recommended as the best available variety.

3310 Rautou, S. & Bertin, C.
Nouveaux hybrides de maïs. (**New maize hybrids**).
Progr. agric. vitic. 1960 : **154** : 43–49, 91–96.

Information is provided on INRA321, INRA640, United 32, Wisconsin 690 and Funk G75A, all of which have been included in the Official Catalogue of Varieties since 1959.

3311 Caputa, J. & Popow, G.
La productivité du maïs hybride F_1 et celle de la culture issue de sa multiplication (F_2). (**The productivity of F_1 hybrid maize and of F_2 material derived from it by multiplication**).
Rev. rom. Agric. 1961 : **17** : 19–21.

The relative performance of double-cross maize hybrids (referred to as F_1 seed) and bulked progeny obtained from the hybrids (referred to as F_2 seed), was investigated in trials conducted between 1954 and 1960 at a number of centres in Switzerland. As regards maize for silage production, the dry matter yields obtained from F_1 seed of three U.S. hybrids exceeded the yields from F_2 seed by an average of 17·8%. Grain yields from F_1 seed of Wisconsin 270 were, on average, 10% higher than yields obtained from F_2 seed.

3312 Astadžov, N.
(**Intervarietal hybrids, an important reserve in the struggle for high maize yields**).
Bjul. nauč.-proizv. Inform. dobrudž. selskostop. nauč.-izsled. Inst. (Bull. sci.-ind. Inf. Dobrudža sci.-res. Inst.) 1959 : **3** : No. 1 : 16–22 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 87 : p. 61. [Bulgarian]. (Mimeographed).

The results of hybridizations effected at the Dobrudža Agricultural Research Institute are described. Hybrids from combinations of Čirpan 87, Čirpan 96, A–26 and Dobrudža with VIR 42 were the earliest to ripen. The highest yield of grain was obtained from VIR 42 x Dobrudža; A26 x Dobrudža came second in this respect but its yield decreases from year to year. The hybrid Goldener Pferdezahn [Golden Dent] x Dobrudža proved most suitable for irrigated conditions.

3313 **Hybrid maize gives increased yield.**
Indian Fmg. 1961 : **10** : No. 10 : p. 39.

At the Indian Agricultural Research Station, New Delhi, high yields were obtained from Texas 26 x KT26.

3314 Vieira da Silva, J.
Contribuição para o estudo de um programa de melhoramento de milho na região do Chimoio. (**Contribution towards a study of a maize breeding programme in the Chimoio region**).
Estud. agron., Lisboa 1960 : **1** : 319–35.

The best conditions for maize cultivation in

Moçambique are described. Observations have been made on the behaviour in the Chimoio region of a number of inbred lines previously tested in Angola; 15 white dent and 5 white flint lines were selected and single crosses between them are under observation in 1960–61, together with a number of top crosses with a local population of Hickory King.
Selfed lines are also being produced from Hickory King, Rhodesian hybrid 1, Iowa Silvermine and Potchfestroom Pearl.

3315 Bockholt, A. J. & Collier, J. W.
Corn hybrids for Texas.
Bull. Tex. agric. Exp. Sta. 1960 : No. 968 : Pp. 10.
Information is provided on the performance of hybrids tested during the three-year period 1957–59 at 22 centres in Texas.

3316 Crane, P. L. & Alvey, D. D.
Performance of commercial dent corn hybrids in Indiana, 1957–1960.
Res. Bull. Purdue Univ. 1961 : No. 711 : Pp. 16.
Data are given on a large number of dent maize hybrids with respect to yield, moisture percentage at harvest, percentage of broken or lodged plants and stand.

3317 Diakonu [Diaconu], P.
(Preliminary results on standardization of double-cross hybrids in the Rumanian People's Republic).
Kukuruza (Maize) 1959 : No. 11 : 61–63. [Russian].
Recent trials of maize double crosses introduced from Canada, USA and other countries in 14 different climatic zones of Rumania are reported. Details of growth periods and grain yields of the hybrids greatly outyielding the Rumanian standards are provided.

3318 Hulpoi, N., Negomireanu, V. & Sarca, T.
Experienţe cu porumb dublu hibrid în condiţii de irigaţie pe cernoziomul mediu degradat de la Fundulea—Bucureşti.
(Experiments with double maize hybrids under irrigated conditions on the semidegraded chernozem of Fundulea, Bucureşti).
Probl. Agric., Bucureşti 1960 : **12** : No. 5 : 26–36.
Yield data are given for a series of double hybrids, mainly American, but some Russian and Rumanian, under various types of irrigation and at various fertilizer levels.

3319 Musijko, A. S. & Sinicyna, A. I.
(The productiveness of maize hybrids in connexion with the growing conditions of the initial material).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 9 : 63–67. [Russian].
Growth, development, ear weight, number of ears per plant and grain yield per ha. of the single crosses Slava [Glory] (44 x 38) and Svetoč [Torch] (40 x 43) and the double cross VIR42 [Institute of Plant Industry 42] (Slava x Svetoč) at Odessa depended on the place of origin of the inbred lines and single crosses respectively. The most productive single crosses were obtained from the seed of inbred lines originating from the Kuban' research station and the most productive double crosses from single crosses grown at the Krasnodar agricultural institute. Information is provided on the reduction in grain yields, ear weights and 1000-grain weights in the F_2 and later generations.

3320 Rubcova, M. S.
(Some physiological characteristics of maize hybrids and the initial inbred lines).
Fiz. Rasten. (Phys. Pl.) 1960 : **7** : 695–700. [Russian].
Single and double crosses had higher rates of photosynthesis and respiration than the inbreds and had a lower content of free aminoacids and other nonprotein nitrogenous compounds in the leaves. The protein content in the hybrids was higher.

3321 Toniolo, L.
Prova di epoche di semina in un confronto fra ibridi e varietà locali di mais. **(Tests of sowing times in a comparison between maize hybrids and local varieties).**
Agricoltura d. Venezie 1961 : **15** : 11–21.
Comparisons of two local varieties from northern Italy and two Italian hybrids, sown at different dates, were made in 1957–59. In all three years the hybrids yielded more than the varieties, the mean yield of Insubria 521 being 73·5 c. per ha. compared with 49·6 c. from Marano, the variety with a similar type of yellow flint grain. Three of the types gave the best yields when sown at the normal time, in late April, whereas the late hybrid 420 Asgrow, in the maturity class 700, yielded more when sown in early April.

3322 [**A glorious path (on the occasion of the 60th anniversary of the birth of M. I. Hadžinov**)].
Kukuruza (Maize) 1959 : No. 12 : p. 37.
Hadžinov's results in maize breeding and genetical studies in the past 40 years are discussed. At the present time he is engaged with G. S. Galeev at the Kuban' research station of the Institute of Plant Industry in transferring the Moldavian type of male sterility to maize hybrids, in particular to the double crosses VIR 42 [Institute of Plant Industry 42], VIR 25, VIR 156, VIR 267 and VIR 281 and the top crosses Bukovina 2 and 3.

3323 Kovarskij, A. E.
(**Genetical and breeding research with maize**).
Kukuruza (Maize) 1959 : No. 10 : 34–37. [Russian].
At Kišinev, many single crosses, double crosses and other hybrids which greatly outyield the standards VIR 25 [Institute of Plant Industry 25] and VIR 42 have been bred. The hybrids include Kišinev 109 and Kišinev 112, both distinguished by earliness and the former also by drought resistance. In two cultivars the protein content of the grain has been raised from 12–13% to 15·7–19·5% by a method combining inbreeding and selection. New inbreds include some that are tolerant of temperatures around zero. New forms with a more pronounced form of the Moldavian type of sterility were found. Male sterility has been imparted to diverse stocks. Restorer lines in respect of the Moldavian type of male sterility are being searched for and some are now available.

3324 Morris, J. L.
Prolific hybrids for the cornbelt.
Crops & Soils 1960 : **13** : No. 3 : 7–8.
Recent studies on multiple-ear maize hybrids are discussed.

3325 Monestiroli, C.
Mielmais prezioso mangime. (**Mielmais, a valuable fodder**).
G. Agric. 1961 : **51** : p. 79.
The hybrid Mielmais [cf. XXX, 3882], being sterile, produces no grain and most of the nutritive value is found in the foliage. Its maturity period is 90–100 days. Figures are given showing the sucrose content of its sap to be 9·87% compared with 6·80 in the cultivar Caragna; its protein content was 7·93% of the dry weight compared with 4·52 in Caragna and its yield of green matter 700 c. per ha. compared with 650 c.

3326 Stoilov, M.
(**Maize hybridization in Bulgaria**).
Kukuruza (Maize) 1959 : No. 10 : 62–63. [Russian].
Recent accessions to the high-yielding Bulgarian hybrids include the double crosses 81 and 82 from Poljanovgrad. They greatly outyield the intervarietal hybrids such as A 26 x Čirpan 96. Among high-yielding double crosses introduced from Russia and America, VIR 42 [Institute of Plant Industry 42] is mentioned as giving an F_2 which produces heterotic hybrids on crossing with Čirpan 87 or Čirpan 96.

3327 Naumović, B. & Pešev, N.
Proučavanje hibrida kukuruza dobivenih ukrštanjem samooplodnih linija s timočkim žutim višeredim tvrduncem. (**A study of hybrid maize obtained by crossing inbred lines with many-rowed Timok Yellow Flint**).
Arh. poljopr. Nauk. 1960 : **13** : No. 39 : 17–33.
Hybrids between 17 American inbreds and Timok Yellow Flint had better drought resistance, more vigorous early growth and improved kernel quality compared with single and double-cross American hybrids; most of them also retained the high lodging resistance of the inbred parents. Of 36 hybrids tested, 27 outyielded Timok, four of them by more than 30%. One of these, T x W23, had good kernel quality, was shorter-stemmed than Timok and matured 4 days earlier than the latter.

3328 Robinson, H. F. & Cockerham, C. C.
Heterosis and inbreeding depression in populations involving two open-pollinated varieties of maize.
Crop. Sci. 1961 : **1** : 68–71.
In further studies [cf. XXVIII, 2912] on Jarvis, Indian Chief, F_1 and F_2 hybrids between them, and selfed progenies of the varieties, it was found that the relationship between performance and degree of heterozygosity was essentially linear for both yield and ear height. It is concluded that "the lack of evidence for epistasis leads one to doubt its importance relative to dominance and additive effects of genes. If it is important, then the epistasis must be of the kind that allows a linear relationship between performance and level of heterozygosity." Heterosis for yield, but not for ear height, was manifested in the varietal cross.

3329 Kudrev [Kădrev], T., Stoilov, M. & Georgiev, D.
(Physiological and biochemical investigations of hybrid maize).
CR Acad. bulg. Sci. 1959 : **12** : No. 4 : 353–56 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 106 : p. 74. [Bulgarian]. (Mimeographed).
The effects of different combinations of vitamins on the growth of detached roots of hybrid seedlings are reported. Differences are noted in the relative proportions of DNA and RNA in the roots of hybrids showing marked and weak heterosis.

3330 Mumm, W. J.
Multiple-eared corn. A new development in corn growing.
Seed World 1961 : **88** : No. 3 : 14, 16.
Semidwarf, multiple-ear hybrids have been developed at Crow's Hybrid Corn Company, USA, by crossing maize and teosinte and then crossing the progeny with semidwarf inbreds originating from maize introduced from Guatemala [XXX, 2634]. Tests of combine harvesting the multiple-ear hybrids by various types of machines have given encouraging results. Comments are included on other agronomic advantages of this type of hybrid.

3331 Sagajdak, I. N.
(Variability of vegetative hybrids in the year of grafting).
Kukuruza (Maize) 1959 : No. 10 : 39–40. [Russian].
In experiments at Odessa on embryo transplantation of one botanical variety of maize on another, the vegetative hybrids showed morphological variability in respect of shoots, leaves and male inflorescences. The hybrids were also variable in shape, colour and consistency of grains on selfing. The plants of yellow dent/yellow flint for instance bore 1·4–88·9% flint ("xenia") grains. The "xenia" grains were mostly of the same kind as the graft component which supplied the endosperm and root or intermediate between the grafting components, but some plants bore grains resembling other botanical varieties.

3332 Popov, G. T.
(The importance of local varieties).
Kukuruza (Maize) 1959 : No. 11 : 47–48. [Russian].
The local maize variety Kičkasskaja, which is productive of grain in most seasons in the province of Orenburg, is thought to provide useful material for breeding varieties with tall and leafy stems and with high attachment of the ears to the plant.

3333 Jarčuk, T. A.
[Local maize varieties as breeding material (A new hybrid VIR 346)].
Kukuruza (Maize) 1959 : No. 12 : p. 36. [Russian].
At the Kuban' research station of the Institute of Plant Industry (VIR), local varieties are being used as one or both of the parents in a crossing programme. Among the hybrids produced is the top cross VIR 346 (Gruševka x single cross Krasnodar 3). In grain yield and growth period it approximates VIR 42 but in forage yield it is superior to this double cross and all other hybrids.

3334 Bianchi, A., Morandi, A. & Pozzi, M.
A cytological abnormality in a multiple tester of maize.
Genet. agr. 1960 : **10** : 325–32.
In almost every PMC of a genetic stock of this type, one or more of the pachytene chromosomes have one or more unpaired segments. The centromere region is however usually regularly paired. No other stage of meiosis is irregular and seed fertility is normal. The abnormality does not lead to any decrease in frequency of crossing over, as indicated by data on regions of chromosomes 2 and 9. The irregularity is probably better described as precocious desynapsis than as incomplete synapsis.

3335 Silin, A. G. & Fal'kova, T. V.
(The dynamics of photosynthesis in different maize varieties).
Fiz. Rasten. (Phys. Pl.) 1960 : **7** : 507–15. [Russian].
The rate of carbon assimilation was higher in early-maturing varieties than in late-maturing ones; the former also had a higher transpiration rate.

3336 Faludi, B., Faludi-Dániel, A. & Gyurján, I.
Genetical differences in the photosynthetical utilization of light. I. Lability of assimilatory pigments at different light intensities.
Acta. biol., Budapest 1960 : **11** : 285–93.
Tests conducted on normal and albino seedlings of Martonvásár 1135/55 showed that low light intensities favour the synthesis of carotenoids whereas high intensities promote chlorophyll development. Data obtained also indicated that "the turnover rate of pigments is dependent on intraspecific hereditary properties and

depending on the light intensity it may be different in individuals of a single species."

3337 Roder, W.
Zur Keimungsphysiologie und Saatgutqualität von Maissorten. I. Beziehungen zwischen Tausendkorngewicht und Keimtemperatur auf Keimfähigkeit und Keimgeschwindigkeit. (**The physiology of germination and seed quality of maize varieties. I. The relationships of thousand-grain weight and germination temperature to germination capacity and rate of germination**).
Z. landw. Vers.-UntersuchWes. 1960 : **6** : 105–20.

Amongst the 20 varieties studied, 1000-grain weight varied between 253 and 360 g.; there was no relationship between 1000-grain weight and germination capacity. Whereas the average germination capacity of imported varieties was 93·2%, that of the German varieties was 74·6%. Most of the German varieties showed better germination than the foreign varieties at 8° C. The rate of germination at temperatures above 12° C. was significantly lower in the German varieties than in the others and there were also differences between the foreign varieties in this respect. The swifter germination of the foreign varieties is attributed to their having dent grains which take up water more quickly than flint maize.

3338 Spasojević, S.
Praktična vrednost bokorenja kukuruza. (**Practical value of tillering in maize**).
Zborn. Rad. biol. Inst., Beograd 1957 : **1** : No. 3 : Pp. 11.

Investigations on the yielding capacity of different combinations of inbred lines of maize are reported. The results indicate that the yield of both grain and fodder from maize can be substantially increased by planned utilization of forms that tiller. The maximum yield improvement was obtained from double crosses, amounting to increases of up to 69% in weight of ears and 113% in weight of dry stalks.

3339 Lengyel, Á.
Új módszer a kukorica izolálásában. (**A new method in maize isolation**).
Egri Pedagóg. Főiskol. Füzet. Eger. 1960 : **181** : 339–42 : from Hungar. agric. Rev. 1960 : **9** : No. 3 : p. 9. (Abst.).

In this method, plants in which the tassel is just emerging but the styles are not yet visible should be used. The stalk above and below the topmost node is bent at an angle of 90°, allowing the male inflorescence to approach the female and enabling them to be tied into the two ends of an open-ended isolation bag 50 cm. long and 20 cm. wide. Wadding should be tied round the tassel base to prevent foreign pollen from entering. The bag remains in position until maturity.

3340 Korobova, S. N.
(**Microsporogenesis and development of pollen grain in maize**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1961 : **136** : 233–36. [Russian].

The division of the sperm cell commences in the pollen grain but is completed at a later stage; the sperm nuclei remain at telophase until they fuse with the female cells.

3341 Walden, D. B. & Everett, H. L.
A quantitative method for the *in vivo* measurement of the viability of corn pollen.
Crop. Sci. 1961 : **1** : 21–25.

Experiments employing the method referred to as the K assay [cf. XXX, 1221] are described. The results confirmed the earlier findings and indicated that the silk remained receptive for 8–10 days after exposure when not pollinated.

3342 Bianchi, A. & Marchesi, G.
The surface of the leaf in normal and glossy maize seedlings.
Z. VererbLehre 1960 : **91** : 214–19.

Electron-microscope studies on the leaves of seedlings segregating for normal and glossy leaf surface demonstrated that (1) normal leaves (*Gl*) have a large number of conspicuous wax bodies; (2) leaves of gl_1 seedlings have few or no wax bodies; and (3) gl_2, gl_3 and gl^H seedlings, while clearly distinguishable from each other, are all intermediate between *Gl* and gl_1.

3343 Nickerson, N. H. & Embler, T. N.
Studies involving sustained treatment of maize with gibberellic acid I: Further notes on responses of races.
Ann. Mo. bot. Gdn. 1960 : **47** : 227–42.

The following four types, representing three races, were investigated: New York Flint; the southern dents Gourdseed and Cherokee Dent; and Argentine Pop. As in the previous study [XXIX, 3832], internode diagrams indicated that the effects of gibberellic acid depended on both the race and concentration. Degree of

inbreeding appeared to be closely related to sensitivity to the chemical.

3344 Nickerson, N. H.
Studies involving sustained treatment of maize with gibberellic acid II: Responses of plants carrying certain tassel-modifying genes.
Ann. Mo. bot. Gdn. 1960 : **47** : 243–61.

Plants containing one of the following genes were treated with mixtures of gibberellic acid (GA) and distilled water every third day throughout the growing season until tassel emergence: ts_2 (tassel-seed 2), Ts_5 (tassel-seed 5), Ts_6 (tassel-seed 6), *Vg* (vestigial glume), *Tu* (tunicate), ra_1 (*ramosa* 1) and ms_1 (male-sterile 1, identical with tassel-seed 8). GA treatment suppressed the expression of ra_1. The expression of ts_2, Ts_5, Ts_6, *Tu* and *Vg* was modified, but all the mutants remained recognizable. Mutant ms_1 retained its male sterility. The effects of GA upon mutants may be at least partly dependent on the amount of auxin present at a critical time in the plant part affected.

3345 Anderson, R. A., Vojnovich, C. & Griffen, E. L. (Jun.).
Wet-milling high-amylose corn containing 66- to 68-percent - amylose starch.
Cereal Chem. 1961 : **38** : 84–93.

While the over-all results with maize containing 66·7% amylose were not quite as satisfactory as those obtained from ordinarly dent, the wet-milling quality of the former type was reasonably good and was better than that of maize with 49, 57 and 68% amylose. The pedigree of the 66·7%-amylose sample, which was a dent hybrid, had been modified so as to introduce more favourable wet-milling characteristics. The results may therefore be considered to be promising from the point of view of developing high-amylose maize with processing properties similar to those of the ordinary type.

3346 Carić, V. & Hadžijev, D.
Sadržaj provitamina A u nekim sortama i hibridima kukuruza. (**The content of provitamin A in some maize varieties and hybrids**).
Savremen. Poljopr., Novi Sad 1959 : **7** : 142–48.

Laboratory determinations, using a modified version of Cooley and Koehn's method, indicated that the content of provitamin A was higher in Ohio C92 and Vukovarski žuti zuban [Vukovar Yellow Dent] than in nine other lines.

3347 Gotlin, J.
Kvalitativne osobine hibrida i sorti kukuruza za dobivanje kvalitetne silaže. (**Qualitative characters of maize hybrids and varieties for production of quality silage**).
Savremen. Poljopr., Novi Sad 1959 : **7** : 558–68.

Factors influencing the suitability of maize for silage production are discussed. Tests conducted at Zagreb showed that Wisconsin 692 possesses a satisfactory combination of these factors and is superior for silage making to Arizona, Iowa 4316 and Vukovarski.

3348 Emel'janov, I. E.
(**Experiments in other countries on breeding maize for northern districts**).
Kukuruza (Maize) 1959 : No. 11 : 51–52. [Russian].

An account is given of breeding maize varieties and hybrids withstanding low temperatures at different stages of development in the USA, Canada and several European countries.

3349 Musijko, A. S. & Ključko, P. F.
(**The breeding of varieties and hybrids for new districts**).
Kukuruza (Maize) 1959 : No. 10 : 41–44. [Russian].

Maize adapted to new areas should be tolerant of low temperature and earlier and more productive of grain than the common double crosses of the Institute of Plant Industry. As a preliminary step to production of such hybrids a series of inbreds have been developed at Odessa, including fifth-generation inbreds of some north Russian varieties and third-generation inbreds of Canadian and Netherlands material.

3350 Murdy, W. H.
The strengthening system in the stem of maize.
Ann. Mo. bot. Gdn. 1960 : **47** : 205–26.

A detailed account is given of investigations which have been briefly reported elsewhere [cf. 411].

3351 Ullstrup, A. J.
Bacterial stripe of corn.
Phytopathology 1960 : **50** : 906–10.

At Purdue University, Ind., fifty inbred lines were artificially inoculated with *Pseudomonas andropogonis*. The lines which showed most resistance were R39, B37, Ill. 90 and K148.

3352 Marić, A. & Kosovac, Z.
Proučavanje uzroka i štetnosti crvenila kukuruza u Vojvodini. (**A study on the cause and injurious effects of reddening of maize in Vojvodina**).
Savremen. Poljopr., Novi Sad 1959 : **7** : 1028–43.

Fungi isolated from diseased maize plants were identified as *Penicillium*, *Fusarium* and *Pythium* spp. and *Cephalosporium acremonium*. Local varieties, notably Rumski Zuban [Ruma Dent], were more resistant to the reddening disease than hybrid lines. The most resistant of the hybrids tested was Wf_9 x 38–11.

3353 Focke, I. & Focke, R.
Prüfung der *Pythium*-Resistenz beim Mais im Embryonentest. (**Testing of *Pythium* resistance in maize in the embryo test**).
Züchter 1960 : **30** : 285–91.

Tests were carried out on excised embryos using a method which has some practical advantages over the similar procedure of Hooker and Dickson [cf. XXII, 316]. Varieties differed markedly in their susceptibility to *Pythium* but reacted consistently to different species of the pathogen. There was no direct relationship between grain size and susceptibility. The semi-dent varieties were most resistant and the flint and starch maizes were only slightly attacked; most of the dent varieties and sweet corn and popcorn were severely attacked. Dent varieties showed early development of adventitious roots and so could continue to develop even when the primary root was heavily infected. The semi-dent varieties were mainly crosses of dent and flint forms and so combined the relatively good resistance of the flint roots with early development of adventitious roots. Dent x dent hybrids and flint x dent hybrids surpassed in each case the better parent with regard to *Pythium* resistance.

3354 Nelson, R. R. & Ullstrup, A. J.
The inheritance of pathogenicity in *Cochliobolus carbonum*.
Phytopathology 1961 : **51** : 1–2.

Pathogenicity of *C. carbonum* on maize seedlings was controlled by a single gene, inherited independently of the gene for compatibility [XXX, 2649]. Of 400 monoascosporic isolates from race 1 x race 2, 203 were classifiable as race 1 and the remainder as race 2. All isolates from race 1 x race 1 and race 2 x race 2 were respectively race 1 and race 2. Ascospore progenies from all crosses segregated in a 1 : 1 ratio for compatibility. Each race was found in both compatibility groups in nature, but nearly all wild-type isolates in compatibility group A were race 1, while nearly all in group a were race 2. Since host resistance and pathogenicity are each controlled by a single gene, the disease should prove useful for the fundamental study of the nature of resistance and pathogenicity.

3355 Sosnina, M. A. & Begljarova, L. S.
(**The susceptibility of maize to smut**).
Kukuruza (Maize) 1959 : No. 10 : 30–31. [Russian].

Pioneer 388a, Krasnodar 5 and VIR 156 [Institute of Plant Industry 156] were superior in resistance to *Ustilago* to other varieties and hybrids tested in the Samarkand province of Uzbekistan. They were also more productive of grain, their respective yields being 86·8 c., 78·7 and 72·4 per ha.

3356 Hirschhorn, E.
Acción de gases de formaldehido sobre *Ustilago maydis* y algunos caracteres de las mutantes producidas. (**Action of formaldehyde gases on *U. maydis* and some characters of the mutants produced**).
Rev. Invest. agríc. B. Aires 1960 : **14** : 296–306.

Monosporidial cultures of strains VIII–1, VIII–2, VIII–3 and VIII–4 of *U. maydis* were exposed to the vapour produced by 0·2 ml. formaldehyde during a 45 sec. period. All sporidia of VIII–1 were destroyed by the treatment but 12 mutants were obtained from the other strains. The mutants are classified into three groups on the basis of differences in cultural characteristics. Details are provided on the pathogenic and cultural characters of progeny derived from crosses between one of the groups, "tipo minuto", and strain VIII–1.

3357 Yakovleva, N. P.
(**Some laboratory methods of estimating the varietal resistance of maize to smut**).
Izv. timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1960 : No. 6 : 204–08. [Russian].

In a comparative study of three methods of measuring resistance to *Ustilago zeae*, certain varietal differences were noted. In a 14-entry trial, the least susceptible lines were Bukovina 2 and Krasnodar 1/49. Under conditions of moisture deficit, varieties became increasingly susceptible to the disease. This tendency was less marked in Krasnodar 1/49 and VIR42

[Institute of Plant Industry 42] than in six other lines.
A count of the percentage of diseased plants in a population artificially infected with a 0·2% spore suspension appeared to be the best method of assessing varietal differences.

3358 Madhav Shankar Pavgi
Morphology, taxonomy and cytology of the corn rust fungi.
Diss. Abstr. 1960 : **21** : LC Card Mic. 60–3249 : 419–20. (Abst.).
A summary is given of investigations on the morphology of spore types of *Puccinia sorghi*, *P. polysora* and *P. purpurea*, from the standpoint of taxonomic problems. "The 3 species are considered valid within the species concept in the Uredinales."
Genes conditioning morphology in a clone apparently functioned independently of those controlling pathogenicity.
Meiotic study of *P. sorghi* revealed a chromosome number of $n = 5$. "Similar basic chromosome number in *Zea mays* L. supports the hypothesis of contemporaneous evolution of host and parasite. Study of the chiasmata distribution and crossing-over will elucidate location of factors for pathogenicity, variability and heterozygosity in continued inbreeding of biotypes."

3359 Horber, E.
Versuche über Maiszünsler-Resistenz im Tessin. (**Experiments on corn borer resistance in the Tessin**).
Maydica, Bergamo 1961 : **6** : 23–24; also in Italian 24–25.
Several lines from Iowa and flint lines from Italy displayed greater resistance than Ohio M34, which is frequently grown in the Swiss Canton of Tessin. Comparative tests in an infested area showed both Ohio M34 and Wis. 641AA to be more susceptible than the local varieties Nostrano dell'Isola and Marano. Double-cross hybrids based on resistant lines from America displayed greater standing capacity and were more resistant to the first generation of borers, though their ears were more severely attacked than were those of Nostrano dell'Isola and Marano.

3360 **Multiple-eared hybrids readied in Michigan.**
Crops & Soils 1961 : **13** : No. 5 : p. 18.
Early-maturing high-yielding two-eared maize hybrids are being developed at Michigan State University from crosses between early, single-eared, northern inbreds and prolific multiple-eared types from the south. The best selections have been screened for resistance to *Pyrausta nubilalis*. Even under very dry conditions the hybrids produce at least one ear.

3361 Kosovac, Z.
Prilog poznavanju osetljivosti našeg sortimenta kukuruza na hormonske herbicide. (**Studies on the sensitivity of our collection of maize varieties to hormone herbicides**).
Hibrid. Kukuruz Jugoslav. 1960 : **3** : No. 12 : 57–62.
Differences in the response of maize varieties and hybrids to MCPA are reported.

BARLEY

3362 **Report of the Barley Committee of the European Brewery Convention. Trials 1959** : Pp. 169.
The results of trials of the field performance of barley varieties grown in 13 west European countries during 1959 are summarized [cf. XXX, 1544]. In addition to the obligatory varieties Kenia (standard), Beka, Ingrid, Svalöv 50/102, Union and Wisa, the optional varieties Hafnia, Hunter (SA x K17/8), Sejet 1722, Vienna and Volla were sown in a number of trials. Proctor was included as a standard for good malting quality. Barleys other than the eleven mentioned were also tested in some countries. These comprised Carlsberg II, Dana (Nordgard 116), Balder, Aurore, H x R811, Haisa, Nova, Delta, Jarle (Voll 90/47), Weibull 5492 and Svalöv 02148. The results of barley and malt analyses are also reported.
Sufficient information has now been obtained concerning Beka, Ingrid and Wisa, which are to be replaced by more recently developed barleys. A summary of the performance of these three varieties is provided.
L. E. Hudson contributes a statistical examination of the results of micromalting trials during the past four years, and J. R. A. Pollock information on the micromalting procedures employed in the various countries. The report of the Analysis Committee to the EBC Barley Committee, dealing with a standard method of estimating the extract from small quantities of malt, is also included. The method is considered to be useful in evaluating malting quality at an early stage in selection.

3363 Zomergerst, 1961. (**Spring barley, 1961**).
Landbouwvoorlichting 1960 : **17** : Bijl. 75; Ber. Rassenkeuze No. 292 : Pp. 4.
Yield data and descriptive notes are given for 20 barleys tested since 1950 in the Netherlands.

The malting barley Bock (MGH55–026), which has yielded well on clay soils in the south-west, has been admitted to the Netherlands varietal list.

3364 Wiebe, G. A. & Hayes, J. D.
The role of genetics in the use of agricultural chemicals.
Agron. J. 1960 : **52** : 685–86.

A report is given on cooperative investigations carried out by the Welsh Plant Breeding Station, Aberystwyth, and the U.S. Department of Agriculture to study varietal response to DDT and its inheritance in barley. The commercial barleys tested comprised 87 six-rowed and 20 two-rowed spring varieties and 53 six-rowed winter varieties grown commercially in North America. The seedlings were sprayed with the chemical at the two or three-leaf stage. Only 5% of the varieties were resistant. No resistant variety was found among the winter barleys. The frequency of resistant varieties among the spring types in the world collection maintained by the US Department of Agriculture was of the order of 10%. The resistant spring barleys were mostly of the two-rowed type, only 1% of the six-rowed group being resistant, as against 40% in the two-rowed group. Sixteen resistant varieties were found among 43 two-rowed wild barleys of the *Hordeum spontaneum* type. Data on crosses between resistant and susceptible varieties were in agreement with those reported by Hayes [XXIX, 2654] in showing that resistance was recessive and under the control of one major gene. The results point to the significance of genetics in the use of agricultural chemicals as a method of crop protection in general. Furthermore, differential reaction to DDT and other chemicals may play a part in population shifts in crops. Use of a DDT-resistant variety of barley in an area where all other varieties grown are susceptible could provide a means of maintaining varietal purity. The production of hybrid barley may also be envisaged, according to a scheme based on *ddt* for DDT resistance and a very closely linked recessive gene for male sterility in combination with the phytocidal action of DDT [3369].

3365 Kasha, K. J. & Walker, G. W. R.
Several recent barley mutants and their linkages.
Canad. J. Genet. Cyt. 1960 : **2** : 397–415.

Male-sterile brachytic (ms_3) was situated 0·6 cross-over units from *lg*, probably to the right, in linkage group 2. Respectively, the genes for yellow stripe (*ys*) and absent lower lateral spikelets at the base of the ear (*als*) lay 4 units to the right and probably about 20 units to the left of *uz* in group 3. Two independent genes, lb_2 and lb_3, each causing a long, weak basal internode, were in groups 4 and 1, respectively, lb_2 being 1·5 units, probably to the left, from gl_2. Mottled–3 (mt_3) showed little likelihood of being in any of the marked regions of the linkage map, with the possible exception of the extreme right region in group 5. A gene for "triple-awn lemma" (tr_2), found in the *als* mutant, was closely linked with *als*. Two genes for minor elongation of the basal internode, neither allelic with *lb* (group 7), were respectively present in the lb_3 and $lb_3{}^m$ mutants; $lb_3{}^m$ has only a moderate effect on the basal internode. The modifier in the $lb_3{}^m$ mutant was assigned to group 2. From recombination and exchange point-to-gene values, it is inferred that the centromere in group 3 was in the region a_c–a_n, probably between x_o and *Bt*.

3366 Larter, E. N. & Enns, H.
The influence of gibberellic acid on the development of hybrid barley ovules *in vivo*.
Canad. J. Genet. Cyt. 1960 : **2** : 435–41.

The ♀ parents were autotetraploids of OAC21 and Herta, each being pollinated by the diploid form of the corresponding variety. Mother plants were supplied continuously for 12 days with gibberellic acid in a vial inserted at the time of emasculation over the clipped tip of the uppermost leaf of the tiller bearing the emasculated ear. With a treatment with 100 p.p.m., 12-day-old hybrid embryos (3*x*) had a length of 1·6 mm., in contrast to 0·5 mm. for the control embryos. When the excised embryos were germinated on an artificial medium, 98% of those from plants treated with 100 p.p.m. were successfully cultured to the seedling stage. Seedlings transferred to soil after a 20-day period of culture were successfully grown to maturity. Only 3% of the embryos produced on untreated plants germinated. The results are discussed with reference to the metabolism of hybrid-ovule development and possible value of gibberellic-acid application in interspecific crossing.

3367 Fröier, K.
Några grunddrag i den nuvarande kornförädlingen. (**Some features of present day barley breeding**).
Sverig. Utsädesfören. Tidskr. 1960 : **70** : 351–63.

This survey of Swedish breeding projects is concerned chiefly with breeding for reliability

of yield, with particular reference to the development of high tillering capacity, adequate earliness for the region in which the variety is to be grown and disease resistance. Earliness combined with good yield is being sought in crosses of six-rowed and two-rowed varieties from southern Sweden, in crosses between six-rowed varieties from northern Africa and northern Sweden, and in X-irradiated material. The last mentioned has yielded the very early mutant 04080 from Bonus. With respect to quality, breeding for malting and for suitability for bread, flakes and groats is receiving attention.

3368 Suneson, C. A. & Wiebe, G. A.
New breeding program provides better barleys.
Crops & Soils 1960 : **13** : No. 3 : 18–19.
About 7500 barley lines from the world collection were crossed with a male-sterile line. The resulting hybrid seed was bulked and is now being distributed for planting under a wide range of soil and climate conditions throughout the world. [Cf. 1511].

3369 Wiebe, G. A.
A proposal for hybrid barley.
Agron. J. 1960 : **52** : 181–82.
A step-by-step description is given of a plan for obtaining hybrid seed. The plan is based on the occurrence of two recessive genes, *ms* conferring male sterility and *ddt* conferring resistance to DDT. A complete or very close linkage is required between these genes and, if such linkage should not occur in nature, it is suggested that reciprocal translocation may be induced between the chromosomes carrying the genes. Once obtained, the linked genes will be transferred to the variety chosen as seed parent and the BCF_1 plants (*Ms–Ddt ms–ddt*) and BCF_2 plants (1 *Ms–Ddt Ms–Ddt* : 2 *Ms–Ddt ms–ddt* : 1 *ms–ddt ms–ddt*) grown in alternate rows. The latter, according to the plan, are then sprayed with DDT to give a pure stand of ♂ sterile plants so that all seed set by them will have BCF_1 plants as pollen parents and will have the genotypes 1 *Ms–Ddt ms–ddt* : 1 *ms–ddt ms–ddt*; seed is harvested from the sprayed rows only. This seed is then sown and alternate rows are sprayed with DDT; the sprayed rows (♂ sterile) are then pollinated by the unsprayed rows and produce seed with genotypes 1 *Ms–Ddt ms–ddt* : 1 *ms–ddt ms–ddt*. Seed stocks of these genotypes can then be maintained by repeating this last step. Hybrid seed is then produced by sowing this seed in alternate rows with the variety chosen as the male parent; the former is sprayed with DDT to give a ♂ sterile stand producing hybrid seed. Since the male parent is *MsMs*, all the hybrid plants will be fertile. In addition to the single cross, double and three-way crosses are also possible. The extent to which cross pollination would occur under these conditions is not known.

3370 Hänsel, H.
Beobachtungen über albinotische und vireszente Chlorophyllaberranten und deren Nachkommen bei Gerste (*Hordeum vulgare* convar. *distichon*). [**Observations on albino and virescent chlorophyll aberrants and their progeny in barley (*H. vulgare* convar. *distichon*)**].
Z. VererbLehre 1960 : **91** : 358–72.
Observations were made on seedlings of varieties, X_5–X_7 lines and F_3–F_5 hybrids grown in the field. In 1955 when conditions were cold during early development, 0·2–0·4% of the seedlings were white or yellowish lethal aberrants. In the following two years with warmer conditions, the frequency of aberrants was 0·01–0·02% and most of the aberrants were virescent and viable. The crosses and X lines showed no marked tendency to produce either a high or a low percentage of aberrants. Selfed generations of some virescent plants were normally green in one year and albinotic and lethal in another year under colder conditions. In relation to these results, possible sources of error in determining the frequency of chlorophyll mutation in the field are discussed.

3371 Heiner, R. E., Konzak, C. F. & Nilan, R. A.
Diethyl sulphate, a highly effective chemical mutagen, producing few chromosome aberrations.
Wheat Inform. Serv. Kyoto 1960 : No. 11 : 4–5.
[Cf. 1483].

3372 **Chemical found to be important breeding tool.**
Crops & Soils 1961 : **13** : No. 4 : p. 17.
[Cf. 1911].

3373 Snežinskaja, N. T.
(A new malting variety of spring barley).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 63–64. [Russian].
Il'incy 5 was selected from Maja in the Vinnica province of the Ukraine. It is superior to

Hanna Loosdorf in malting and brewing properties and outyields it by 1·2–4·5 c. per ha. It also has high hectolitre and 1000-grain weights, good tillering capacity and resistance to lodging and *Helminthosporium.*

3374 MacDonald, M. D.
Barley pachytene chromosomes and the localization of the Erectoides 7 translocation point on chromosome 5.
Canad. J. Genet. Cyt. 1961 : **3** : 13–17.

Details are provided of a technique found satisfactory for staining and spreading the chromosomes at pachytene. Acetocarmine was used as stain, premordanting being effected with iron alum. An F_1 plant from a cross between the interchange stocks C1483 (1–6) and Ert 7 (1–5) and an F_2 individual homozygous for translocation (1–7) from C1358 (1–7) x C1483 (1–6) were examined at pachytene. The position of the Ert 7 translocation point was determined from measurements of the chromosomes in the first plant. Measured from the centromere, the position of this translocation point was 0·17 on the short arm of chromosome 5. This point was designated 5S.17.

3375 Tsuchiya, T.
X-ray induced chromosomal aberrations in *Hordeum.*
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 58–65.

Dormant seeds of *H. spontaneum* var. *transcaspicum* were exposed to 13,500 r. Of the 49 X_2 plants investigated cytologically, 34 had normal pairing at meiosis I, while 15 showed reciprocal translocations and other irregularities. Two trisomic plants were discovered, one of which was studied with respect to its meiotic behaviour and found to be a tertiary trisomic. In one X_2 individual, complete desynapsis at diplotene and metaphase I was observed. Chromosome g had the highest frequency of interchanges (31·2%).

3376 Shih, C.-S. & Shebeski, L. H.
Sterility in interchange heterozygotes of barley.
Canad. J. Genet. Cyt. 1960 : **2** : 429–34.

Thirty-one crosses were effected among 35 homozygous interchange stocks and 25 crosses were also made between these stocks and normal Montcalm. Seed sterility of the interchange heterozygotes thus obtained increased as the number of chromosomes participating in the interchanges increased. When equal numbers of interchange chromosomes were involved, sterility was dependent on the size of the chromosome ring or rings formed at meiosis. Sterility also varied considerably in crosses in which the same metaphase configurations were observed, indicating that in the heterozygous condition interchanges may have a different effect on fertility.

3377 Shih, C.-S. & Shebeski, L. H.
Chromosome pairing and sterility in the F_1 of interchange stocks involving the same chromosomes in barley.
Canad. J. Genet. Cyt. 1961 : **3** : 1–6.

"Diallel crosses were made within both (a–b) and (c–f) interchange stocks of barley, and PMC's of the F_1 plants were studied. In some crosses a chromosome ring formation at metaphase was seen in the F_1, while in other crosses only bivalents were observed. Semi-sterility was found in plants with and without ring formation.

"A hypothesis is proposed to account for the manner of chromosome pairing and the semi-sterility in the F_1 plants obtained by crossing interchange stocks involving the same two pairs of chromosomes. The determination of the relative position of breakage points in these stocks is also discussed."

[Authors' summary].

3378 Tsuchiya, T., Hayashi, J. & Takahashi, R.
Genetic studies in trisomic barley, II. Further studies on the relationships between trisomics and the genetic linkage groups.
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 153–60.

It was established that the *Hordeum spontaneum* var. *transcaspicum* trisomic Robust carries linkage group IV (*Blbl, Kk*) on its extra chromosome 4 [cf. XXX, 387].

3379 Reinbergs, E. & Shebeski, L. H.
Fertility of barley autotetraploids. II. The relationship of aneuploidy, dwarfing and fertility in four autotetraploid barley varieties.
Canad. J. Pl. Sci. 1961 : **41** : 124–33.

"A considerable number of dwarf plants (16·4 to 85·7 per cent) was found in C_2 to C_5 generations of four artificially-induced barley autotetraploids from the varieties O.A.C. 21, Brant, York and Montcalm.

"The Montcalm tetraploid, which was the lowest in mean fertility, had the highest percentage of dwarfs. In the other three tetraploids there was no apparent relationship between the frequency

of dwarfs and the mean per cent fertility. In the O.A.C. 21 tetraploid continuous selection for plants with high fertility did not reduce the occurrence of dwarfs.

"Most of the dwarf plants were aneuploids with 26, 27, 29, 30 or 31 chromosomes, but plants with identical number of chromosomes often showed differences in phenotype. Among the aneuploids 29-chromosome plants were most frequently found. The 26- and 31-chromosome plants were completely sterile. Only a low percentage of the other aneuploid plants produced seed. By considering the observed percentages of dwarf plants and the ratio of hypoploids to hyperploids produced, the largest part of sterility in the four barley autotetraploids could be attributed to irregular chromosome distribution.' [Cf. XXIX, 2637].

[Authors' summary].

3380 Pollhamer, E.
Kísérleti adatok őszi és tavaszi árpafajták csíranyugalmáról. (**Experimental data on dormancy in winter and spring barley varieties**).
Növénytermelés 1960 : **9** : 231–46.

Seven winter barleys studied at the Martonvásár Agricultural Research Institute, Hungary, had an average dormancy period of 845 days, with little individual deviation from the mean. A collection of 127 spring barleys and a series of X-ray and Co^{60} induced mutants of the spring barley MFB104, with the respective means 62 and 91–5 days, varied between less than 25 days and more than 166 days. Dormancy appeared to be absent in the spring barleys Fruhwirts frühe Goldthorpe [Fruhwirth's Early Goldthorpe], Garton's Brewer's, Earl and Maythorpe. There was evidence of positive correlations between length of dormancy period on the one hand and vigour of germination or productivity on the other in the MFB104 mutants but not in the spring barley collection. Various treatments were effective in reducing dormancy, the winter barleys being least responsive.

3381 Marschner, H.
Über die Nachwirkung von ^{32}P in der 2. Generation von Sommergerste. (**The after effect of P^{32} on the 2nd generation of spring barley**).
Kulturpflanze, Berlin 1960 : **8** : 90–92.

Barley treated in the three-leaf stage with P^{32} showed modifications in development and reduced fertility; the next generation also showed a reduction in fertility but development was not affected.

3382 Scholz, F.
Qualitätsprobleme in der Futtergerstenzüchtung, dargestellt an Ergebnissen von Mutationsversuchen. (**Quality problems in breeding fodder barley shown in the results of mutation experiments**).
Z. Pflanzenz. 1960 : **44** : 105–28.

After a discussion of breeding aims for fodder barley, mention is made of some of the mutants produced at Gatersleben; these include a naked form with 90% of the grain yield of the original form [cf. XXX, 3944]. An early-ripening form with improved yield was obtained by further X irradiation of a naked mutant. Also a smooth-awned fertile mutant with moderately hairy stigmas and others with semismooth awns have equalled the original variety in yield.

Strains of spring barley with an average crude protein content up to 27% higher than that of the original variety were obtained; they showed very little morphological change. These forms were selected from 93,000 X_2 plants and are thought to be true X-ray induced mutants. They show variation in yield of grain but in some cases the yield of protein per unit area was greater than that of the original barley. So far no useful winter barleys with improved protein content have been produced. It is thought that it will be possible to combine high grain yield, high protein content and satisfactory biological value of the protein in one variety.

3383 Niemann, E.
Zur physiologischen Spezialisierung des Gerstenflugbrandes. (**The physiological specialization of barley loose smut**).
Prakt. Bl. PflBau 1960 : **55** : 37–44.

Samples of loose smut from Germany and other countries were tested on 11 different barley varieties from North America and 16 races of smut were distinguished. Possible sources of error in determining races are mentioned.

3384 Pedersen, P. N.
Methods of testing the pseudo-resistance of barley to infection by loose smut, *Ustilago nuda* (Jens.) Rostr.
Acta agric. Scand. 1960 : **10** : 312–32.

Two methods of determining the pseudo-resistance of barley varieties to infection by loose smut are described. One is based on infection tests in the field and the other on the number of florets which open during flowering, cleistogamous flowers being less susceptible than chasmogamous types. The latter method is preferred since it is rapid and inexpensive

and the results show good correlation with infection percentages. The ears are kept in alcohol for about 4 weeks when the glumes become transparent; by viewing against a luminous background it is easy to see whether the anthers, which are dark, have been shed during flowering (open florets) or are still situated between the tips of the glumes (closed floret). The method is applicable only to two-rowed barley varieties.

3385 Vasudeva, E. S., Joshi, L. M. & Sreekantiah, K. R.
Physiologic specialization in *Puccinia hordei*.
Indian Phytopath. 1960 : **13** : 66–67.
Using the 16 differential varieties of barley chosen by Levine and Cherewick, two races (H1 and H2) showing no resemblance to any of those listed by these authors have been identified in India. A biotype of H1, designated H1–A, has also been distinguished.

3386 Tavčar, A.
Genetske promjene na ječmu izazvane gama zracima. (**Genetical changes in barley induced by γ rays**).
Arh. poljopr. Nauk. 1960 : **13** : No. 40 : 3–13.
Air-dried seeds of *Hordeum distichum* var. *nudum* received γ-ray dosages ranging from 300 to 2000 rep. Mutant plants were most frequent at relatively low dosages (700 to 1300 rep.) and included types showing variations in growth habit, height, stem thickness, maturation period, length and density of the ear, spikelet fertility and resistance to *Puccinia simplex*; plants with hulled kernels also occurred.

3387 **We're advancing on yellow dwarf.**
Agric. Res., Wash. 1960 : **9** : No. 6 : 10–11.
Three different strains of the barley yellow dwarf virus have been identified. Each of the strains is usually carried by a different aphid species.

MILLETS AND SORGHUMS

3388 Nemlienko, L. M.
(The millet Mironovka 85).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 64–65. [Russian].
The above *Panicum* millet was selected from an unspecified variety at Mironovka. It outyields Podoljanskoe 24/273 and has better technological properties as a gruel variety. It is fairly resistant to shedding and *Ustilago*.

3389 Rostovceva, Z. P.
(The responses of millet varieties to changes in temperature conditions).
Agrobiologija (Agrobiology) 1959 : No. 6 : 883–87. [Russian].
Tabulated information is provided on the temperatures required by some cultivars and botanical varieties of *Panicum* millet to pass through the vernalization and light phases and the stage of differentiation of the archesporia. Varietal differences are noted and discussed in relation to their ecological adaptation.

3390 Scholz, H.
Der Formenkreis der *Setaria italica* (L.) P.B. Ein Beitrag zur Kulturpflanzenkunde. [**The formenkreis of *S. italica* (L.) P.B. A contribution to knowledge of cultivated plants**].
Ber. dtsch. bot. Ges. 1960 : **73** : 471–76.
Splitting the *S. italica* group into convar. *maxima* and convar. *moharia* is thought to be justified, for the *maxima* group has papillae on the epidermal cells of the glumes and the *moharia* group has no papillae. *S. viridis* is the ancestral type of convar. *maxima*.

3391 Misra, D. K. & Daulay, H. S.
Rajasthan's arid lands can raise better crops.
Indian Fmg. 1961 : **10** : No. 10 : 17–18.
In trials at the Research Farm of the Central Arid Zone Research Institute at Jodhpur, *Pennisetum typhoides* 'RSK' and 'RSJ' were higher yielding and more disease-resistant than local varieties under the very dry conditions obtaining in this region.

3392 Arnon, Y. & Berkovitz, I. [Berkovits, Y.]
(Testing hybrid sorghum).
Sadeh(Field)/Hassadeh 1959 : **39** : 615–17. [Hebrew].
In 1957–58 hybrid-sorghum variety trials, conducted at Beit Dagan and at other centres in Israel, the performance of 25 lines was compared with that of Frontier 400. The latter consistently outyielded all other varieties, except Texas 610, Texas 660, and Amak R10, which were approximately equal to it in yielding capacity. In the one trial in which it was included, Kansas outyielded Frontier 400 by 14%.

3393 Subramanian, A., Meenakshi, K. & Sivagnanam, L.
An economic short duration mutant in Talaivirichan Cholam (*Sorghum roxburghii* var. *hians* Stapf).
Madras agric. J. 1960 : **47** : 517–18.

A mutant, designated Co.19/1, which appeared in a crop of *S. roxburghii* var. *hians* 'Co.19', is shorter than the parent variety, has fewer and narrower leaves and matures a month earlier. Unlike the parent, the mutant flowers after 75 days, irrespective of time of sowing.

3394 Foster, A. E., Ross, J. G. & Franzke, C. J.
Proximity of mutated genes in colchicine-induced mutants of sorghum.
Crop Sci. 1961 : **1** : 72–75.

F_2 populations from crosses between colchicine-induced mutants of Experimental 3 [cf. XXVII, 1810] and their untreated full sibs were studied. Correlations between quantitatively inherited characters showed little evidence for linkage between the mutant characters. Two mutant characters, presence of awns and green coleoptile colour, were simply inherited and were not linked with one another nor with mutant characters inherited quantitatively. It is concluded that the mutagenic effect of colchicine is not limited to a single locus but may affect a large number of independent loci.

3395 Bransberg, G.
South Dakota farmer spends lifetime developing crops.
Crops & Soils 1961 : **13** : No. 5 : p. 28.

Some of the drought-resistant grain sorghums bred by H. Poelstra and included in South Dakota Extension tests are mentioned. One of these is Eureka, a hardy drought-resistant variety which can be harvested while the stalks and leaves are still green since the seed heads dry out before the rest of the plant. Another promising strain now under observation is said to be a heavy grain producer; the plants are leafy and cast a heavy shade which enables them to compete successfully with weeds.

3396 Magoon, M. L. & Shambulingappa, K. G.
Karyomorphological studies in *Sorghum ankolib* var. annalib red, a Eu-sorghum.
Indian J. Genet. 1960 : **20** : 166–77.

Idiograms of pachytene and somatic metaphase chromosomes of *S. ankolib* 'Annalib Red' are presented. Close agreement was found between the idiograms in relative length, arm ratio and centromere position of the chromosomes. Chromosome VI however had an arm ratio of 1 : 5 at pachytene compared with 1 : 3 or 1 : 2·5 at somatic metaphase; chromosome condensation studies indicated that the variability in arm ratio in this chromosome is due almost entirely to reduction in the length of the long arm during spiralization.
Both pachytene and somatic metaphase chromosomes exhibited differential staining, with deeply stained proximal regions and unstained distal regions. Pairing of homologous chromosomes was initiated in the proximal regions while the separation of the divided chromosomes began in the distal regions. A critical examination of the bivalents at diacinesis showed chiasmata to be absent or only rarely present in the deeply stained regions.

3397 Divakaran, K.
Factors for tillering in *Sorghum* spp. (*S. subglabrescens*).
Curr. Sci. 1960 : **29** : p. 487.

The F_1 of the cross between the nontillering varieties Co. 18 and K2 was single-stalked. The F_2 segregated into nontillering and tillering plants with a 13 : 3 ratio. It is suggested that the character of tillering was introduced by Co. 18, which also may carry a factor inhibiting tillering by suppressing development of the basal buds; in the past this variety has shown a greater tendency than K2 to tiller under the influence of ratooning, insect damage or wider spacing.

3398 Quinby, J. R. & Karper, R. E.
Inheritance of duration of growth in the milo group of Sorghum.
Crop Sci. 1961 : **1** : 8–10.

From crosses with five strains of known maturity genotype, the genetic constitution $Ma_1ma_2ma^R_3$ is given for Ryer Milo which blooms about 44 days after planting; the Ryer allele ma^R_3 is thought to be a mutation from the recessive gene ma_3. The allelic series at the third locus, in order of increasing earliness, is Ma_3, ma_3 ma^R_3. The recessive gene ma_3 modifies the expression of the dominant genes Ma_1 and Ma_2 but ma^R_3, when homozygous, produces extreme earliness regardless of the presence of dominant genes. Gene ma^R_3 is similar to ma_1 in action, both producing earliness when homozygous; ma^R_3 plants however are the earlier. Plants homozygous for both ma_1 and ma^R_3 have been obtained; these resemble Ryer but bloom at 38 days. It is suggested that Ma_1, Ma_2 and Ma_3 are dominant inhibitors that block some essential reaction leading to flower

initiation [cf. XVI, 776]; ma_1 and ma^R_3 behave like amorphic alleles and ma_2 and ma_3 like hypomorphic alleles. Speculating on the wild form from which domestic sorghums were derived, the author suggests that the former may have been a small, very early-maturing type.

3399 Stickler, F. C. & Pauli, A. W.
Influence of date of planting on yield and yield components in grain sorghum.
Agron. J. 1961 : **53** : 20–22.

In tests of eight varieties during 1958 and 1959 at Manhattan, Kansas, highly significant differences for grain yield in relation to sowing date and variety were found. Sowing date x variety interaction was also highly significant. In general, yield response was related to the time of maturity of the variety. With one exception, highly significant *F* values were noted for varieties, sowing dates and sowing x variety interaction for the individual yield components of (1) 200-seed weight, (2) number of seeds per panicle and (3) total number of panicles on the main culms and tillers per unit area. In both years, a differential contribution of the tillers to yield was detected in relation to both variety and sowing date. Simple and partial linear correlations revealed that yield was associated with (1) and (2) in 1958 and with all three components in 1959. This discrepancy is interpreted on the basis of a disparity in tiller development between the two years. With one exception, correlations between the individual components of yield were not significant. Yield, (1) and (3) for 1958 were correlated with the corresponding values for 1959; no correlation between years was found for (2). Leaf areas per plant were greater in 1958 than in 1959, because of the profuse tillering by all genotypes in the first year, but leaf area and yield were not significantly related.

3400 Casady, A. J.
Inheritance of resistance to physiologic races 1, 2, and 3 of *Sphacelotheca sorghi* in sorghum.
Crop Sci. 1961 : **1** : 63–68.

Resistance to *S. sorghi* races 1, 2 and 3 was found in each case to be conditioned by a single gene pair designated Ss_1ss_1, Ss_2ss_2 and Ss_3ss_3 respectively. The resistant variety Spur feterita is considered to carry all of these genes in the homozygous dominant condition. The reactions of F_1 progenies from crosses of this variety with two susceptible varieties indicated that dominance is incomplete. The three genes appear to be linked, the order of genes and approximate crossover percentages being Ss_2 (6·94) Ss_1 (37·95) Ss_3. There was no indication of linkage between any of the resistance genes and genes conditioning dry *v.* juicy stalk (*Dd*), presence *v.* absence of testa (*Bb*) or presence *v.* absence of smooth pericarp (*Ss*). Data from the cross Dwarf Yellow Milo x Spur feterita showed the two parents to carry the same gene for resistance to *S. sorghi* race 1 and suggest that the latter parent is not a true feterita but a feterita-milo derivative.

RICE

3401 Horvat, F.
Recherches radiobiologiques chez *Oryza sativa.* II. Effets des rayons X, des neutrons et des rayons gamma. (**Radiobiological investigation on *O. sativa.* II. Effects of X rays, neutrons and γ rays**).
Agricultura, Louvain 1961 : **9** : 165–214.

Studies of plants of Balilla and OS6 grown from grains treated (1) in the dry state with (*a*) X rays at 15,000, 20,000, 25,000, 50,000 or 75,000 r., (*b*) neutrons at 3 x 10^2 n./cm.^{2} or (*c*) γ rays at 15,000, 30,000 or 50,000 r. and (2) at the germinating stage with X rays at 25,000 r. are reported. Germination was reduced by treatments 1*a* (75,000 r.), 1*c* and 2. Flowering was generally early with treatments 1*a* and 2, but was reduced by X rays at 75,000 r. and treatment 1*c*. Grain yield was reduced by 1*a*, 1*c* and 2 owing to an increase in sterility, but was improved by 1*b*. Sterility tended to disappear in subsequent generations. Treatments 1*a* (50,000 and 75,000 r.) and 1*b* appeared to increase winter survival, and straw stiffness improved in some instances. With γ-ray treatment, chlorophyll mutants appeared in the irradiated generation, while with X-ray treatment they did not appear until the next generation. Sterile mutants increased in number proportionately with dose.

Rice improvement in Taiwan.
Chin.-Amer. Comm. rural Reconstr. : Pl. Indust. Ser. 1959 : No. 15 : Pp. 92.

3402 *Chang, H. S. The rice breeding program and its recent development in Taiwan.* (*pp. 11–22*).

A survey is given of the aims, methods and achievements of breeding, chiefly with *japonica* rice.

3403 *Ou, S. H. & Lin, K. M. Preliminary report on rice breeding for blast disease resistance in Taiwan.* (*pp. 23–32*).

Work carried out on resistance to blast (*Piricularia oryzae*) during the past decade and current problems are described. Varieties highly resistant to leaf blast have been found mostly among native lowland and mountain rice, only a few Peng-lai (= Horai) varieties being resistant. No immune varieties have been discovered. Lines of the *japonica* type with promising degrees of resistance have been developed from various crosses. Resistance is apparently dependent on one or more incompletely dominant genes, which are linked with undesirable characters. The sterility encountered in crosses between native and Peng-lai varieties has constituted another problem. Introduction of resistance into Peng-lai rice, followed by back crossing to a commercial variety such as Taichung 65, is considered to be the most satisfactory method. Preliminary results with material derived from seeds of Taichung 65 treated with X rays and Co^{60} in the USA suggest that induction of resistant mutants may be possible. Other problems requiring investigation are the occurrence of physiological races, the role of environmental factors in causing inconsistency in varietal reaction and the nature of resistance. No native and Peng-lai varieties proved to be highly resistant to neck blast. Methods of artificial inoculation during the limited period of liability to become infected with neck blast are required for determining resistance more accurately than is possible under field conditions.

3404 Evatt, N. S. & Beachell, H. M.
Ratoon cropping of short-season rice varieties in Texas.
News Lett. FAO Internat. Rice Comm. 1960 : **9** : No. **3** : 1–4.

CI9433 and CI9434, two promising selections maturing in approximately 100 days, gave yields similar to those obtained from standard commercial varieties in trials conducted at the Rice-Pasture Experiment Station, Beaumont, Tex., in 1958–59.

3405 Richharia, R. H.
The possible use of vegetative propagation in rice (*Oryza sativa* L.).
Sci. & Cult. 1960 : **26** : 239–40.

At the Central Rice Research Station, Cuttack, India, multiplication of the perennating stubble during the offseason by repeated propagation of individual tillers has been successful. Formation of tillers by the activation of dormant buds is more pronounced in photoperiodically sensitive, long-duration varieties than in insensitive ones. Probably prolongation of the vegetative phase in sensitive varieties until the advent of the favourable season for initiation of the reproductive phase provides the opportunity for more abundant development of dormant buds. This method of vegetative propagation may prove useful in breeding, genetical work and the multiplication of pure varieties. [Cf. 3406].

3406 Richharia, R. H. & Misro, B.
Utilisation of the technique of vegetative propagation in rice breeding.
Curr. Sci. 1960 : **29** : p. 480.

The value of stubbles for the maintenance and multiplication of intraspecific and interspecific hybrid material, particularly when highly or completely sterile, at the Central Rice Research Institute, Cuttack, is described [3405]. The method has also proved useful in studying the inheritance of photoperiodic reaction. In addition, the possibility of taking advantage of hybrid vigour by multiplying the F_1s by this means is being explored.

3407 Evatt, N. S., Johnson, T. H. & Beachell, H. M.
The response of short strawed rice varieties to varying levels of nitrogen fertilization.
News Lett. FAO Internat. Rice Comm. 1960 : **9** : No. **3** : 5–12.

In trials conducted at Beaumont, Tex. and Stuttgart, Ark., two short-strawed selections, CI9187 (early maturing) and CI9205 (very early maturing), responded well to high rates of nitrogen fertilization. B502A2–98–1, a short-strawed midseason selection, performed well at all rates of fertilization in the Arkansas trial but lodged at the higher rates of fertilization in the Texas trial.

3408 Sala Dasananda
Rice in Thailand.
News Lett. FAO Internat. Rice Comm. 1960 : **9** : No. **4** : 23–29.

In the rice-breeding programme in Thailand, particular attention is being paid to the development of varieties resistant to *Piricularia oryzae* and *Gibberella fujikuroi*.

3409 Shama Rao, H. K. & Bora, K. C.
Differential radiosensitivity in rice (*Oryza sativa* Linn.) at the genotypic level.
Nature, Lond. 1961 : **189** : 762–63.

Segregation ratios observed in the N_2 and N_3 of neutron-treated material indicated that an

N_1 plant was heterozygous for a recessive mutation for albinism. In one experiment (1) on radiosensitivity, seeds from the heterozygous N_1 plant were exposed to X rays, while in another experiment (2), seeds from an N_2 individual known to be a homozygote for the dominant gene for green were X-irradiated, in addition to seeds of the N_1 plant. With increasing doses above 20 kr., the rate of numerical decrease of albinos in relation to green seedlings rose significantly, so that eventually, at 40 kr., the N_2 segregation ratios for green to albino seedlings in (1) and (2) were respectively 9 : 1 and 9·5 : 1, instead of 3 : 1. This result is attributed to the greater lethality of the albinos and greater radiosensitivity of the recessive homozygote. A difference in radiosensitivity was also detected in (2) between the green homozygotes and heterozygotes. At 40 kr., there was more than a fourfold decrease in seedling emergence in the mixed population of homozygous and heterozygous green plants, as compared with the N_3 dominant homozygotes. Presumably the greater radiosensitivity of the recessive gene was expressed even when heterozygous. Whether the greater sensitivity of the recessive allele was due to a pleiotropic effect, mutation of a closely linked gene or albinism *per se* could not be ascertained.

3410 Nagao, S. & Takahashi, M.
Genetical studies on rice plant, XXIV. Preliminary report of twelve linkage groups in Japanese rice.
J. Fac. Agric. Hokkaido Univ. 1960 : **51** : 289–98.

From inheritance studies conducted over a number of years at the Plant Breeding Institute, Hokkaido University, data are provided for 37 genes comprising 12 linkage groups which are here mapped. [Cf. XXIX, 2675].

3411 Nagao, S., Takahashi, M. & Kinoshita, T.
Genetical studies on rice plant, XXV. Inheritance of three morphological characters, pubescence of leaves and floral glumes, and deformation of empty glumes.
J. Fac. Agric. Hokkaido Univ. 1960 : **51** : 299–314.

Pubescence of the leaves is conditioned by two complementary genes, Hl_a and Hl_b; a recessive gene, *gl*, conditions glabrous leaves and also glabrous glumes. Pubescent glumes are conditioned by a single incompletely dominant gene, *Hg*, which also conditions pubescence of leaf margins, auricles and panicle branches. A dominant modifying gene designated *Su–g* is postulated to produce the condition in which the glume supporting the palea is long while that supporting the lemma is short; it is suggested that the gene acts as a suppressor when present with *g*, which is recessive and conditions long glumes. The possibility that *gl* and *An* (awned) may be linked is mentioned. [Cf. 3410].

3412 Hsieh, S.-C.
Genic analysis in rice. I. Coloration genes and inheritance of other characters in rice.
Bot. Bull. Acad. sin. 1960 : **1** : 117–32.

Ten strains designated as markers by Nagao and Takahashi [cf. XXII, 1943] and by Jodon [cf. XXIV, 943] were crossed with Taichung 65, in an attempt to reexamine certain gene systems suggested by these and other investigators. Segregation data confirmed that apiculus colour is controlled by three complementary genes, *C*, *Sp* and *A*. Stigma colour is controlled by a modifying gene *Ps* which is hypostatic to *C*, *Sp* and *A*. Two complementary inhibitors, Ip^s_1 and Ip^s_2 appear to control *Ps*; the second of these inhibitors is linked with *Sp*. Gene systems controlling colour in various parts of the leaf and stem appeared to be similar to that responsible for stigma coloration.

Bent (twisted) stem is controlled by two recessive genes, ts_1 and ts_2; the former is linked with *Sp*. Linkage relationships were also found between ts_1 (or ts_2) and *ltg* (long twisted grain), ts_1 (or ts_2) and *d* (dwarfness in strain 7237), and between *Sp* and *d*; recombination values were calculated for each of these linkages.

3413 Yeh, B. P.-S.
Cytogenetic relationships between cultivated rice and other diploid species of *Oryza*.
Diss. Abstr. 1960 : **21** : LC Card Mic. 60–2986 : 435–36. (Abst.).

The normal meiosis and high to complete fertility observed in F_1 hybrids of *O. sativa* with *O. sativa* vars. *fatua* and *formosana* and with *O. balunga* (*O. perennis* var. *balunga*) indicated a very close cytogenetic relationship between *O. sativa* and the three Asiatic wild forms. *O. balunga* is classified as a separate species on account of differences in morphology and habit. Hybrids of *O. sativa* with *O. perennis* vars. *cubensis* and *barthii* were essentially normal in meiosis but almost completely sterile. It was concluded that *O. perennis* is a distinct species but closely related to *O. sativa*. Direct and

indirect cytogenetical evidence confirmed that vars. *cubensis* and *barthii* should both be placed in *O. perennis*. All hybrids of *O. sativa* with *O. glaberrima* were completely sterile, a high frequency of meiotic irregularities being observed. It was concluded that *O. glaberrima* is somewhat distantly related to *O. sativa*. Similar results obtained from cytogenetical studies of *O. glaberrima* x *O. balunga*, *O. breviligulata* x *O. sativa* and *O. sativa* x *O. stapfiii* indirectly confirmed the extremely close relationship between *O. sativa* and *O. balunga* and the very close one between *O. glaberrima* and *O. breviligulata* or *O. stapfiii*. The low viability, disturbed chromosome behaviour and complete sterility of F_1 hybrids between *O. sativa* and *O. officinalis* were indicative of a more distant relationship between these two species.

O. sativa, *O. sativa* vars. *fatua* and *formosana* and *O. balunga* are considered to contain the same genome (A_1), and varieties of *O. perennis* a genome (A_2) somewhat differentiated from A_1, although basically similar. *O. glaberrima*, *O. breviligulata* and *O. stapfiii* possess, it is suggested, a distinct genome (E). The genome of *O. officinalis* is regarded as different from A or E, but its designation must await further cytogenetical analysis. Two probable ways in which *O. sativa* evolved in south-east Asia are suggested: (1) directly from *O. balunga*, or (2) indirectly from *O. balunga*, with *O. sativa* var. *formosana* or var. *fatua* or both these varieties as its immediate progenitor or progenitors. The author's observations confirm Chevalier's suggestion that *O. breviligulata* was the ancestor of *O. glaberrima*.

3414 Constantin, M. J.
Characteristics of red rice in Louisiana.
Diss. Abstr. 1960 : **21** : LC Card Mic. 60–2974 : 407–08. (Abst.).

Laboratory studies were carried out on variation in grain characters of red rice occurring as a weed in southwestern Louisiana. All plants had shattering spikelets, a red testa and pubescent hulls. Genetic variation was detected in hull colour, the awned condition, colour, pubescence and length of the awns, grain length and width, percentage of kernel breakage and intensity of testa colour, the range of variation in most of these characters being wide. Three hull-colour types (straw, grey and black) were distinguishable; they also differed genetically in the awned condition, awn colour and length, grain length and percentage of kernel breakage. Red rice is probably an introduced type of *Oryza sativa* var. *fatua*, which has been subsequently modified by natural hybridization with cultivated rice. South-east Asia is the probable centre of origin, from which red rice spread to other countries as mixtures in seed rice.

3415 Khadilkar, B. T.
A dwarf earhead mutant in *Oryza sativa*.
Poona agric. Coll. Mag. 1960 : **51** : No. 2 : 13–14.

A dwarf mutant with a highly compact, erect and nonshedding inflorescence was discovered in the variety Dodka at the Phondaghat Agricultural Research Station, Ratnagiri District, Maharashtra State. The mutant, which is cytologically normal, is expected to be useful as a parent on account of several economic characters.

3416 Hu, C. H., Chang, W. T., Weng, T. S. & Li, H. W.
The utilization of X-ray radiation for rice improvement.
Bot. Bull. Acad. sin. 1960 : **1** : 109–16.

Early-maturing, nonshattering and *erectoides* mutant lines were produced by subjecting seeds of two *japonica* and eight *indica* varieties to X irradiation. Particularly promising high-yielding lines were derived from Taichung 65 and Liu-chou. One mutant line from the latter outyielded the original variety by more than 30%.

3417 Mucci, F.
Prove comparative di rendimento su stirpi di recente costituzione e cultivar di riso. (**Comparative yield tests on recently produced lines and on cultivars of rice**).
Ann. Staz. sper. Risicolt. Colt. irrig. 1956 : **4** : 159–75.

Trials carried out in 1955–56 showed the back cross P6 x (P6 x Blue Rose) to be earlier than the control, Americano 1600, but more susceptible to diseases. Selections from Cody were high in yield and standing capacity, though somewhat irregular in maturity. High yields were also obtained from Roverbella [XXVI, 3379]. Good results were obtained from a line from the cross Agostano x R77, which gave rise to Lomello [XXVI, 2392]; it has been named Balocco and is described as an awnless rice with high tillering and standing capacity, resistance to disease, midseason maturity and good yield of clear rice of the common class. Another line, selected from Lady Wright, has been named Olcenengo and is described as a midseason variety, resistant to lodging and

highly resistant to diseases, producing rice of the semifine class.

3418 Tinarelli, A.
Classificazione e riconoscimento delle varietà italiane di riso. (Classification and recognition of the Italian varieties of rice).
Riso, Milano 1961 : **10** : No. 2 : 8–12.
Definitions are given of the types common, semifine, fine and superfine; the last category includes only types with grain over 6·4 mm. in length and of outstanding quality. The other features taken into consideration in describing the varieties are specified and a table is given showing the characteristics of the main Italian cultivars in respect of grain size, weight and shape.

3419 Hu, C.-H.
A preliminary report on meiotic chromosomes, especially on pachynema of *Oryza granulata* Nees.
Bot. Bull. Acad. sin. 1960 : **1** : 139–44.
Cytological studies on *O. granulata* showed that the species has a diploid chromosome number of 24 and possesses a caryotype similar to that of *O. sativa* and *O. glaberrima*. Univalents, quadrivalents and hexavalents, as well as secondary associations of bivalents, were observed at metaphase I.

3420 Krishnaswamy, V. & Thangavelu, S.
Preliminary observations on the tillering of the rice plant under deep water conditions.
Madras agric. J. 1960 : **47** : 521–22.
The variety Co.25 produced one primary tiller at soil level and 4–5 secondary tillers from aerial nodes when grown under deep-water conditions, compared with 4 primaries and 19 secondaries produced by a typical deep-water variety.

3421 Shastry, S. V. S., Sharma, S. D. & Ranga Rao, D. R.
Cytology of an inter-sectional hybrid in Oryza.
Naturwissenschaften 1960 : **47** : 608–09.
At the Indian Agricultural Research Institute, New Delhi, a study of meiosis in an *O. sativa* x *O. officinalis* hybrid revealed a reduction in the number of chromosome associations from complete pairing (12_{II}) at pachytene to univalents only (24_{I}) at metaphase. It is concluded that claims, based on metaphase studies, that the two species are genomically distinct should be reexamined. It is considered that reproductive isolation could occur by the development either of cross-incompatibility mechanisms or of complementary desynaptic mechanisms, neither of which need necessarily be accompanied by chromosome structural differentiation. The complete sterility of the hybrid is explained on the assumption that, while the chromosomes are sufficiently homologous for prophase pairing, some genetic differentiation has occurred.

3422 Van, T. K.
Quality testing of rice in Malaya with particular reference to milling and cooking.
Malay. agric. J. 1960 : **43** : 19–27.
Information is provided on methods used by the Malayan Department of Agriculture in evaluating varieties and strains (1) for milling and cooking quality by means of small samples and (2) in the commercial grading of rice.

3423 Kempanna, C.
Preliminary investigations on the effect of different dates of sowing of paddy (*Oryza sativa* L.) on some of the yield contributory characters.
Mysore agric. J. 1960 : **35** : 60–73.
The effect of different sowing dates on duration of the life cycle, tillering, plant height, panicle length, spikelet and grain number per ear, lodging, disease and pest resistance, and grain and straw yield in the varieties H320, S749 and S1092 is reported.

3424 Ganguly, D. & Padmanabhan, S. Y.
***Helminthosporium* disease of rice. III. Breeding resistant varieties—selection of resistant varieties from genetic stock.**
Indian Phytopath. 1959 : **12** : 99–110.
Standardized techniques were used at the Central Rice Research Institute, Cuttack, to determine the relative susceptibility of 538 varieties to *H. oryzae* (*Cochliobolus miyabeanus*). Two Chinese varieties, Ch.13 and Ch.45, and four Indian varieties, T141, T498–2A, BAM10 and Co.20, showed resistance to the pathogen.

3425 Bhapkar, D. G. & D'Cruz, R.
Inheritance of blast resistance in rice.
Poona agric. Coll. Mag. 1960 : **51** : No. 2 : 23–25.
Data on the F_1 and F_2 of EK70 x Bavadya, H566 x Zinya 31 and T3 x K540 are interpreted as indicating that resistance is dominant over susceptibility and dependent upon one or two

major factors. It is thought that variation in susceptibility among the F_2 survivors was probably under polygenic control.

FORAGE GRASSES

3426 CHARLES, A. H.
Differential survival of cultivars of *Lolium*, *Dactylis* and *Phleum*.
J. Brit. Grassl. Soc. 1961 : **16** : 69–75.
Variations in the response of different cultivars to a number of agronomic factors were noted.

3427 ILIEV, A.
(Aims and achievements of the Fodder Plant Department of the Marica Scientific Research Institute, Plovdiv).
Nauč. Trud. nauč.-izsled. Inst. Furažite (Sci. Proc. sci.-res. Inst. For.), Pleven 1959 : **1** : 9–17 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 141 : p. 95. [Bulgarian]. (Mimeographed).
Mention is made of new varieties of leguminous forage crops and grasses bred at this station.

3428 LUBENEC, P. A.
(Cultivation, breeding and seed production of perennial herbage plants in Canada).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 205–32. [Russian].
An account is given of the cultivation of perennial herbage plants in Canada, the species grown, the breeding work, the main varieties grown and the organization of seed production.

3429 *SINSKAJA, E. N.
(The most important wild forage plants of the North Caucasus).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 149–204. [Russian].
The results of detailed studies of the plant associations in the North Caucasus are reported. Ten species of *Medicago* are described; the most widely distributed is the endemic diploid *M. quasifalcata*, which is surrounded on all sides by tetraploid species ($2n = 32$) such as *M. glutinosa*, *M. glandulosa* and *M. falcata*. Its relationships to the other three diploid species, *M. romanica*, *M. coerulea* and *M. hemicycla* are discussed but cannot be decided from the available information. Natural hybrids of *M. glutinosa* with *M. falcata* and *M. hemicycla* have been found. Many of the ecotypes described are regarded as promising breeding material because of their resistance to drought, leafiness, fodder quality and other properties and a scheme for their utilization in crossing programmes is presented.
Ecotypes of *Onobrychis biebersteinii* growing at altitudes of 1500–2500 m. are distinguished by winter hardiness, compact habit and leafiness. Some of the ecotypes have previously been described as distinct species such as *O. grossheimii* and *O. daghestanica* and other species that merge imperceptibly into *O. biebersteinii* are *O. hamata*, *O. inermis* and *O. cyri*.
Wild ecotypes of *Trifolium pratense* almost indistinguishable from cultivated red clover have been found. Others are distinguished by drought resistance and winter hardiness. Other clovers that occur are *T. ambiguum*, *T. hybridum*, *T. repens* and *T. apertum*, the last being considered a probable ancestor of *T. alexandrinum*.
Some forms of *Vicia angustifolia* are equal to the common vetch in vigour and leaf size. Other species of vetch include *V. grandiflora* and *V. ciliatula*, an endemic species considered worthy of further study.
Strong resemblances were observed between some of the ecotypes of *Festuca pratensis* and those of *F. orientalis*. Promising ecotypes have been found in *F. sulcata* and *F. beckeri*, the former being of interest for their persistency and low moisture requirements.
Both *Dactylis aschersoniana* ($2n = 14$) and *D. glomerata* ($2n = 28$) are found and the view is expressed that the latter evolved from the former, the chromosome duplication being a concomitant feature and not a cause of the speciation.
Phleum alpinum occurs at high altitudes and is thought to have given rise to *Ph. pratense* on migrating towards the plains; *Ph. nodosum*, which also occurs, is regarded as a distinct species, since it crosses more readily with *Ph. alpinum* than with *Ph. pratense*.
Bromus riparius merges with increasing altitude into *B. variegatus*, which may, it is thought, be the original form which evolved here from a creeping type resembling *B. biebersteinii*.

3430 CARNAHAN, H. L. & HILL, H. D.
Cytology and genetics of forage grasses.
Bot. Rev. 1961 : **27** : 1–162.
This review is intended as a sequel to the

* An extended summary of this work is on file at the Bureau.

survey by Myers which appeared 14 years ago [XVIII, 237]. The main headings are as follows: caryotype analysis and phylogeny; chromosome numbers; accessory, supernumerary and B chromosomes; polyploidy; monohaploids and polyhaploids; aneuploidy; meiosis; interspecific and intergeneric hybridization; inheritance of qualitative characters; inheritance of quantitative characters; variations in natural populations; apomixis; and conclusions. A table listing interspecific and intergeneric hybrids and another denoting $2n$ numbers additional to those referred to by Myers are included. The bibliography comprises 679 references.

3431 Tiemann, H.
Die Erzeugung und Erkennung von Tetraploiden bei Gramineen. (**The production and recognition of tetraploids in the Gramineae**).
Züchter 1960 : **30** : 202–05.

Eight methods of inducing polyploidy were compared using *Lolium multiflorum* var. *westerwoldicum* 'Bernburg'. Treatment with colchicine gave a higher proportion of polyploid plants than treatment with acenaphthene. The easiest and most effective method involved treating germinated seeds with an 0·05% aqueous solution of colchicine for 4 hr. at 28–30° C. Diploid and tetraploid plants could be distinguished by the size of the stomata, pollen grains, inflorescence and seed and the thickness of the leaf.

3432 Connor, H. E. & Penny, E. D.
Breeding systems in New Zealand grasses. II. Gynodioecy in *Arundo richardii* Endl.
NZ J. agric. Res. 1960 : **3** : 725–27.

Gynodiecy has been established as the breeding system in the above species. [Cf. XXVIII, 568].

3433 Connor, H. E.
Breeding systems in New Zealand grasses. III. *Festuceae*, *Aveneae* and *Agrostideae*.
NZ J. agric. Res. 1960 : **3** : 728–33.

Deyeuxia billardieri and *Koeleria kurtzii* are considered to be self fertilizing. *Festuca novae-zelandiae* and *F. matthewsii* showed inbreeding depression in the S_1. It is concluded that they are outcrossing species. *F. multinodis* was self sterile. *Poa colensoi* was again found to be self sterile [XXVIII, 568].

3434 Borkovskaja, V. A., Guržieva, A. V., Stankevič, A. K. & Šarapova, N. V.
(Influence of presowing vernalization of the seeds and conditions of the point at which they are grown on the phenotypic composition of populations of herbage plants).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 127–48. [Russian].

Observations were made on the behaviour of ecotypes of a number of species of forage grasses and legumes of varying provenance, when sown with and without vernalization in different localities in the Soviet Union. Almost all populations of winter perennial or annual species contained a certain number of plants which flowered when sown in spring, though individual plants differed in the time at which they flowered and in their vernalization requirements. Selection of seed from the plants that flowered raised the proportion of spring forms to 66–93% in *Lolium multiflorum* and to 100% in *Onobrychis transcaucasica*, *O. arenaria* and *O. viciaefolia*. Similar increases were obtained in *Bromus riparius* and several of the other species, though no truly spring forms have yet been obtained in *Festuca pratensis* and *Dactylis glomerata*. Selection for spring forms within the population was most effective when performed in southern regions whereas selection for winter forms was most effective in the north. In *B. riparius* a number of different types were found, differing in the way they form their secondary shoots.

3435 MacKay, K. H.
Variations in cross-fertility in two xenogamous grasses, *Bromus inermis* Leyss and *Phleum pratense* L.
Diss. Abstr. 1960 : **21** : LC Card Mic. 60–3232 : p. 414. (Abst.).

Differences between plants in cross fertility and average seed weight were highly significant in both of the above species. In 78 plants of brome grass, cross fertility ranged from 7 to 91%, and seed weight from 240 to 560 mg. per 100 seeds. Corresponding figures for 14 plants of timothy were 32–70% and 32–47 mg. A cursory examination of 41 plants of timothy revealed wider ranges in fertility and seed weight. In both species, the microenvironment influenced fertility, as indicated by highly significant differences between clones within plants and by significant variation among inflorescences of the same clone. In brome, a positive association was found between fertility

and seed weight; number of spikelets per panicle was negatively related to seed weight and floret number per spikelet. Fertility and seed weight did not vary significantly with spikelet position; distal florets within all spikelets were however generally lower in fertility and seed weight than proximal florets but produced significantly more florets. In timothy, seed weight was negatively correlated with fertility and pollen stainability; vigour was essentially unrelated to fertility but was negatively associated with seed weight. Distal portions of timothy spikes had significantly greater fertility and fewer seeds and florets per cm. than the proximal parts. All plants produced slightly heavier seeds in the distal portion of the spikes, three plants producing significantly heavier seeds in this region. Determinations of average seed weight in timothy should therefore be based, it is suggested, upon samples from a bulk representing one or more spikes. The ratio of seed weight to total spike weight is recommended as a reliable and efficient index of fertility in this species.

3436 Wright, N. & Streetman, L. J.
Grass improvement for the southwest relative to drouth evaluation.
Tech. Bull. Ariz. agric. Exp. Sta. 1960 : No. 143 : Pp. 16.

A review is given of literature dealing with morphological and physiological characters associated with drought tolerance in plants and with techniques of evaluating response to soil and atmospheric drought. On the basis of the information thus gained, suggestions are made as to the methods of evaluation most likely to be useful in breeding grasses with better drought tolerance for the southwestern region of the USA.

3437 Fejer, S. O.
Response of some New Zealand pasture species to vernalisation.
NZ J. agric. Res. 1960 : **3** : 656–62.

A study was made of the effects of vernalization upon flowering in six varieties of ryegrass, ten samples of red clover and six varieties of timothy. The ryegrasses comprised New Zealand (NZ) pedigree perennial, short-rotation and Italian ryegrasses, an F_2 derivative of NZ perennial ryegrass x NZ short-rotation ryegrass, and two selections within perennial ryegrass termed Pasture and Hay which resulted from open pollination in the second cycle. The red clovers were NZ pedigree Cowgrass (early flowering), NZ pedigree Montgomery (late flowering) and four commercial samples of each of these two varieties. Differences in vernalization requirements were detected between the ryegrasses. The results confirmed the view that raising two generations of perennial ryegrass in a year is not practicable, as the cold requirement for full flowering was well over 2 months. Intraspecific disparity in vernalization requirement was also found; the Hay type, which is shorter-lived and earlier in flowering than the Pasture type, required a shorter period for full flowering. Response to selection for herbage yield in the development of these two selections was related to earliness and perenniality, which are in turn associated with vernalization requirement. Such intraspecific variation in vernalization requirement could therefore be a useful tool to the breeder. In red clover, Cowgrass required no vernalization; Montgomery flowered fully after 45 days' treatment. The possible use of cold treatment of germinated seeds for growing plants for varietal distinction by means of flowering behaviour is discussed. In timothy, vernalization had no effect.

3438 Bowden, W. M.
Chromosome numbers and taxonomic notes on northern grasses. IV. Tribe Festuceae: *Poa* and *Puccinellia*.
Canad. J. Bot. 1961 : **39** : 123–38.

The following chromosome numbers are reported: (1) *Poa agassizensis*, $2n$ = *ca.* 56; *P. alpina*, 32, 33, 39 and 42; *P. ampla*, 62; *P. annua*, 28; *P. arctica*, 56, 63, 70, *ca.* 75, 78, 82, 85, 86 and 106; *P. arida*, *ca.* 76; *P. canbyi*, 56, 70 and *ca.* 98; *P. cusickii*, 56 and 59; *P. eminens*, 42; *P. fernaldiana*, *ca.* 42; *P. glauca*, 42, 50, 56, 64, 65, 70, 75 and 78; *P. glaucantha*, 44; *P. glaucifolia*, 56, *ca.* 70 and *ca.* 100; *P. interior*, 28, 34, 42 and 56; *P. juncifolia*, *ca.* 60; *P. leptocoma*, 42; *P. nervosa*, 56 and *ca.* 74; *P. palustris*, 28, 30 and 32; *P. pratensis*, 28, 42, 44, 56, *ca.* 66, 67, 70, 74, *ca.* 78, *ca.* 82, 84, 86, 88 and *ca.* 124; *P. saltuensis*, 28; *P. secunda*, 42, 56, 70, *ca.* 78, 80 and *ca.* 90; *P. stenantha*, 42; and *P. trivialis*, 14; (2) *Puccinellia ambigua*, 56; *P. americana*, *ca.* 42 and 56; *P. angustata*, 42; *P. borealis*, 42; *P. bruggemannii*, 28; *P. cusickii*, 28; *P. distans*, 42; *P. glabra*, 42 and 56; *P. hauptiana*, 28; *P. laurentiana*, 42 and 56; *P. longiglumis*, 56; *P. lucida*, 42 and 56; *P. nuttalliana*, 42; *P.* x *phryganodes*, 21; *P. vaginata*, 56; and *P. vahliana*, 14. *P. longiglumis* is a new combination. [Cf. 528].

3439 Hair, J. B. & Beuzenberg, E. J.
High polyploidy in a New Zealand *Poa*.
Nature, Lond. 1961 : **189** : p. 160.
The majority of *Poa* species in New Zealand have proved to be tetraploid ($4x = 28$). One 12-ploid species has been identified. More recently, a collection of *P. litorosa* from the Auckland Islands has been found to approach a 38-ploid condition ($2n = 263–65$).

3440 Borrill, M.
***Dactylis marina* Borrill, sp.nov., a natural group of related tetraploid forms.**
J. Linn. Soc. 1961 : **56** : 431–39.
An earlier study [cf. XXVII, 3048] demonstrated that var. *hackelii* (based on var. *maritima*) could be distinguished from *D. glomerata* ssp. *hispanica* by the presence of epidermal papillae. A survey of Mediterranean populations has now shown that these forms are widely distributed and that, as a group, they exhibit greater phenotypic variation than can be accommodated under the varietal epithet *hackelii*. These forms all share the following characters, none of which was mentioned by Hackel or Domin: (1) a papillose epidermis, (2) inflated flag-leaf sheaths and (3) a tendency to branching at the basal nodes of the culms. It is therefore proposed to give specific rank to this natural group of tetraploids and a validating description is presented.
It is mentioned that unpublished genetical studies indicate that the production of papillae is under polygenic control. A large number of F_1 hybrids between normal and papillose forms was obtained; these exhibit a range of phenotypes which is greater than that found in the natural populations and indicates a hybrid ancestry. The diploid species *D. smithii* and *D. ibizensis* are suggested as possible ancestral forms.

3441 Borrill, M.
The pattern of morphological variation in diploid and tetraploid *Dactylis*.
J. Linn. Soc. 1961 : **56** : 441–52.
Tabulated morphological data are given for 19 *Dactylis* populations collected from the Mediterranean and north European regions and including diploid and tetraploid forms. The diploids form a series, beginning with the small xerothermic types from eastern Algeria and the steppe forms from Iran, and progressing through the montane, possibly forest, ssp. *santai* from western Algeria to the large vigorous ssp. *lusitanica* of western Portugal and *D. aschersoniana* from the central European forests. This phenotypic range is paralleled and exceeded by the tetraploids which fall into two broad groups, namely, the xerothermic Mediterranean types, with small panicles and leaves and strongly-lobed lemmas, and the north European types with large or very large panicles and leaves and almost-entire lemmas; only the population from Sicily is intermediate. Heritability studies indicate that panicle length, flag-leaf length and lemma–apex type are highly heritable and can each be selected for independently. While panicle and flag-leaf length are influenced in the same direction by environmental pressure, it is not certain to what extent the form of the lemma apex is susceptible to environmental influence; experiments are being undertaken to determine the stability and taxonomic value of the latter character.

3442 Borrill, M.
Epidermal characteristics in the diploid subspecies of *Dactylis glomerata* L.
J. Linn. Soc. 1961 : **56** : 453–48.
It was possible to separate eight diploid subspecies of *D. glomerata* on the basis of the following characters: (1) the extent to which the cell wall is smooth, sinuous or beaded; (2) the type of stomatal distribution; and (3) the extent to which the cells are hexagonal or square. When the subspecies were placed in groups on these characters, the arrangement conformed with their geographical distribution. Of three Algerian populations studied, one fell within the limits of ssp. *santai* while the others differed from it in possessing beaded cell walls; the beading was less pronounced in one of these populations and the general form of the epidermis showed some similarity with sspp. *judaica* and *woronowii*.

3443 Sachs, E. & Simon, U.
Beitrag zur Frage der Fluoreszenz bei Weidelgräsern. [**Contribution to the question of fluorescence in ryegrasses (*Lolium* spp.)**].
Bayer. landw. Jb. 1960 : **37** : 466–78.
Seedlings of *L. multiflorum* germinated on filter paper leave a root track which is fluorescent in ultraviolet light while those of *L. perenne* do not. The progenies of reciprocal interspecific crosses exhibited no significant correlation between fluorescence and such parental characters as winter hardiness, growth type and degree of awning.

3444 Buckner, R. C., Hill, H. D. & Burrus, P. B. (Jun.)
Some characteristics of perennial and annual ryegrass x tall fescue hybrids and of the amphidiploid progenies of annual ryegrass x tall fescue.
Crop. Sci. 1961 : **1** : 75–80.

While promising material was obtained from both *Lolium perenne* x *Festuca arundinacea* and *L. multiflorum* x *F. arundinacea* hybrids, the latter was generally more palatable. Several hybrids of both types were more vigorous than the fescue parent and all were perennial. *L. multiflorum* hybrids produced more seeds than *L. perenne* hybrids when pollinated by their respective ryegrass parents, and attempts to improve fertility by colchicine treatment were more successful in the former case. All F_1 hybrids had 28 chromosomes while the colchicine-treated *L. multiflorum* hybrids included one plant with 56, one with 42 and three with 70 chromosomes. A high order of pairing was observed in the hybrids, indicating that pairing occurs between different fescue genomes and also between fescue and ryegrass chromosomes. The 56-chromosome amphidiploid was established in a crossing block together with the four other colchicine-treated plants; thirty progeny plants were obtained from the amphidiploid. The occurrence of various combinations of parental characters in the progeny indicates the possibility of developing forms combining the palatability and nutritive quality of the ryegrass with the adaptation of tall fescue.

3445 Suvorova, T. N.
(Italian ryegrass, *Lolium multiflorum* Lam.).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 3–34. [Russian].

Descriptions are given of the species and its main botanical varieties and the literature dealing with them is reviewed. Three subspecies are suggested, sspp. *gaudini*, *italicum* and *westerwoldicum*, the first being annual, the second perennial and the third alternative. The main biological and agronomic features of the species are also outlined and data are given concerning the history of its cultivation in different countries of Europe, America and Australasia, the best cultivars being named.
Breeding of annual forms suited for conditions in the Soviet Union should, it is thought, be based on populations of the perennial type, which are the most heterogeneous in respect of physiological characters; they could be made more so by crossing with *L. perenne*. Various interspecific and intergeneric hybrids and polyploid forms described in the literature are mentioned.

3446 Peterson, M. L., Cooper, J. P. & Bendixen, L. E.
Thermal and photoperiodic induction of flowering in darnel (*Lolium temulentum*).
Crop. Sci. 1961 : **1** : 17–20.

The effect of a wide range of cold and light treatments on four strains of *L. temulentum* known to differ in their response to cold was investigated. The results indicate that short-day treatments can partially replace low temperatures in inducing flower formation. The possibility of separating cold requirement from long photoperiod requirement in late-heading strains of *L. perenne* is now being studied.

3447 Sinskaja, E. N. & Šarapova, N. V.
(The reasons for the appearance of branched inflorescences in ryegrass species).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 35–52. [Russian].

Comparative descriptions are given of the inflorescences of *Lolium perenne*, *L. multiflorum* and *Festuca pratensis*. Several hybrids of *Lolium* x *Festuca* described in the literature are referred to. Great variations in type of inflorescence were observed in these hybrids and variations of a similar nature have been reported in populations of *L. perenne* and *L. multiflorum* not subjected to hybridization. Experiments are described in which seed of *L. multiflorum* vernalized for varying periods before sowing gave rise to plants showing various anomalies of the inflorescence, including compact inflorescences and a number of different types of branched inflorescences; no attributes of *Festuca* were observed in the aberrant forms; all had awned spikelets and the teeth on the keel of the flowering glume were typical for *L. multiflorum*, showing no signs of hybridization with *L. perenne*. The anomalous inflorescences are therefore not considered to be the result of hybridization; nor are they due to the effect of vernalization, for they were found with equal frequency in the control plants that had not been vernalized. It is thought probable that they were the result of the high conditions of fertility under which the plants were grown

and that their frequency could be increased by selection.

3448 Silsbury, J. H.
A study of dormancy, survival, and other characteristics in *Lolium perenne* L. at Adelaide, S. A.
Aust. J. agric. Res. 1961 : **12** : 1–9.

A collection of perennial ryegrass from the Mediterranean region has been grown as spaced plants since 1956. Three distinct types have been recognized on the basis of morphological characteristics, time of heading, summer dormancy and persistence. The collection has shown greater persistence than commercial cultivars, because of its summer dormancy, which serves as a means of escaping drought. The importance of the material as a source of new genotypes is stressed, since it offers a range from early to late-flowering types, all possessing to a varying degree the capacity for summer dormancy. The Mediterranean lines are now being evaluated in swards under grazing, so as to select the most productive and persistent for synthesizing a new strain.

3449 Lackamp, J. W.
Mite attack in inbred plants of perennial ryegrass.
Euphytica, Wageningen 1960 : **9** : 323–26.

At the Ottersum Plant Breeding Station, Netherlands, attack by *Tarsonemus spirifex* has been observed in inbred lines of *Lolium perenne* but not in normal lines.

3450 Hertzsch, W.
Kreuzungen innerhalb der Gattung *Festuca* und zwischen den Gattungen *Festuca* und *Lolium*. B. Kreuzungen von di- und tetraploidem *Festuca pratensis* mit *Festuca arundinacea* und *Festuca rubra* und von di- und tetraploidem *Festuca pratensis*, *Festuca arundinacea* und *Festuca rubra* mit di- und tetraploidem *Lolium perenne* und *Lolium multiflorum*. **(Crosses within the genus *Festuca* and between the genera *Festuca* and *Lolium*. B. Crosses of diploid and tetraploid *F. pratensis* with *F. arundinacea* and *F. rubra* and of diploid and tetraploid *F. pratensis*, *F. arundinacea* and *F. rubra* with diploid and tetraploid *L. perenne* and *L. multiflorum*).**
Z. Pflanzenz. 1960 : **44** : 301–18.

Details are reported of the morphological differences between the hybrids and their parents. It could not be decided whether panicle formation is dominant over ear formation or whether there is intermediate inheritance. In all the crosses, seed set and germination were better when the parent with the lower chromosome number was used as the mother plant. It is thought unlikely that *F. arundinacea* is an autohexaploid of *F. pratensis* on account of morphological differences between the species. *L. perenne* and *L. multiflorum* gave quite different results in their crosses with *Festuca* species indicating that the genetical difference between the *Lolium* species is greater than was formerly thought [cf. XXX, 1619].

3451 Précsényi, I.
Contribution à la question de l'estimation du rendement des plantes.
(Contribution to the problem of estimating crop yield).
Acta bot. Budapest 1959 : **5** : 425–28.

In yield analyses of *Festuca stricta*, clump circumference in cm. (x_1), shoot number (x_2), plant height in cm. (x_3) and weight in cg. (y) show the following relation: $y = 6{\cdot}50x_1 + 0{\cdot}72x_2 + 16{\cdot}38x_3 - 168{\cdot}99$. A marked positive correlation was found between clump circumference and shoot number.

3452 Borgaonkar, D. S. & de Wet, J. M. J.
A cytogenetical study of hybrids between *Dichanthium annulatum* and *Dichanthium fecundum*.
Phyton, Vicente López 1960 : **12** : 137–44.

"Hybrids between *Dichanthium annulatum* and *D. fecundum* and a back-cross population of the hybrid with *D. annulatum* were studied. It is indicated that most of the characters studied are governed by multiple genes. The sexuality of the pedicellate spikelet, which is the basic difference between the two species, however, appears to be controlled by a single gene. It is believed that the chromosomes pair autosyndetically in these species and in the hybrid, hence true gene exchange between them is prevented. As both these 'species' are facultative apomicts it is suggested that they are not distinct taxonomically and *D. fecundum* does not deserve specific status."
[Authors' summary].

3453 Dewald, C. L. & Harlan, J. R.
Stigma removal studies on certain accessions of *Bothriochloa intermedia* and *Dichanthium annulatum*.
Crop Sci. 1961 : **1** : 15–17.

D. annulatum '55–X–98' ($2n = 40$) was highly self-sterile, *D. annulatum* '3242' ($2n = 20$) and *B. intermedia* '2655' ($2n = 40$) produced selfed seed at a low rate and *D. annulatum* '4099' ($2n = 40$) produced about the same amount of seed as when pollen from another plant of the

same species was applied. While 55–X–98 and 3242 were sexual, the other two were facultative apomicts. Pollen from *D. annulatum* '4099' and '55–X–98' was more effective in stimulating seed set in the *B. intermedia* strain than was the latter's own pollen; in the cross *D. annulatum* '55–X–98' ♀ x *B. intermedia* ♂, set was low.

3454 Babu, C. N. & Srinivasan, K.
Chromosome numbers in the genus *Erianthus*.
Sci. & Cult. 1960 : **26** : 230–31.

Chromosome numbers determined by the authors for 47 collections of *Erianthus* are listed. The numbers for 37 are new records, while those for the remaining 10 collections serve as confirmations of previous counts. As indicated by the numbers found by the authors and other investigators, the genus consists of a polyploid series, $2n$ numbers ranging from 20 in *E. fulvus*, *E. elephantinus* and *E. ravennae* to 100 in *E. maximus*. Forms with the lower chromosome numbers occur chiefly in the Indian subcontinent, especially in the Himalayan region, whereas the higher polyploids have been obtained from Fiji, Java and neighbouring islands. Aneuploidy is exceedingly rare. Types with $2n = 30$, 40 and 60 have been discovered in *E. munja*, but the differences in chromosome number are not related to morphological disparities. Representatives of *E. arundinaceus* have $2n = 30$, 40, 50 and 60, the occurrence of $2n = 50$ in this species being reported for the first time.

3455 **Select Sudan on clipped-yield basis.**
Crops & Soils 1961 : **13** : No. 5 : p. 20.

A comparison was made at the Nebraska Agricultural Experiment Station, Lincoln, Neb., of the yields obtained from six Sudan grass varieties (1) when harvested at the end of the growing season and (2) when harvested in five or six cuttings. In (1) the yields were correlated with maturity, late varieties giving the highest yields. In (2) however, no such relationship obtained and it is concluded that, where the grass is required for summer pasture purposes, selection should be based on yield as determined by the second method.

3456 Sotomayor-Ríos, A., Vélez-Fortuño, J., Woodbury, R., Schertz, K. F. & Sierra-Bracero, A.
Description and cytology of a form of signal grass (*Branchiaria brizantha* Stapf.) and its agronomic behavior compared to Guinea grass (*Panicum maximum* Jack.).
J. Agric. Univ. PR 1960 : **44** : 208–20.

B. brizantha 'Puerto Rico PI1525' from Ceylon had $2n = 36$. Only 15% of the florets developed caryopses; the frequent occurrence of lagging univalents at anaphase I and micronuclei may account for the low seed set. On account of its palatability, high yield and drought resistance, this grass is considered to be promising as a forage crop in Puerto Rico. Improvement in fertility may be expected through genetical research and introduction of other representatives of the species.

3457 Patil, B. D., Hardas, M. W. & Joshi, A. B.
Auto-alloploid nature of *Pennisetum squamulatum* Fresen.
Nature, Lond. 1961 : **189** : 419–20.

P. squamulatum ($2n = 54$) had an average configuration of $3{\cdot}14_{IV} + 1{\cdot}06_{III} + 17{\cdot}90_{II} + 1{\cdot}91_{I}$, the number of quadrivalents ranging from 1 to 8. A single hybrid ($2n = 41$) was secured from *P. typhoides* x *P. squamulatum*. Of the 36 clearly analysable PMCs in the hybrid, 32 contained $16_{II} + 9_{I}$. The remaining 4 cells had $14–15_{II} + 11–13_{I}$. The hybrid therefore apparently arose from the union of an unreduced 14-chromosome gamete of *P. typhoides* with a 27-chromosome gamete of *P. squamulatum*. It also appeared that 7 of the 16_{II} were derived from *P. typhoides* and 9 from autosyndetic pairing of 18 of the 27 chromosomes derived from *P. squamulatum*. The observations further suggested that *P. squamulatum* is an autoallopolyploid with a somatic complement consisting of a 9-chromosome genome in the autotetraploid condition and another 9-chromosome genome in the diploid condition.

3458 Theis, T., Sotomayor-Ríos, A. & Calpouzos, L.
Inflorescence blight on a Napier grass x cattail millet hybrid caused by *Ephelis trinitensis* (*Balansia claviceps*).
Plant Dis. Reptr. 1961 : **45** : 72–75.

In trials in Puerto Rico, hybrids of *Pennisetum purpureum* x *P. glaucum* were susceptible to *B. claviceps*, whereas both parental species have remained uninfected in the island.

3459 Youngner, V. B.
Low temperature induced male sterility in male-fertile *Pennisetum clandestinum*.
Science 1961 : **133** : 577–78.

Introduced in about 1920, *P. clandestinum* is represented in the USA by a ♂-sterile strain and a ♂-fertile strain. At 10° C. under controlled environmental conditions in growth chambers, the stamens of the ♂-fertile strain

were not exserted, although the stigmas emerged normally. At higher temperatures, both stamens and stigmas were exserted. Pollen abortion was high at 10° C. and was increased by lengthening the photoperiod. Seasonal sterility in this species thus appears to be influenced primarily by low temperature. Flowering behaviour in the ♂-sterile strain was not altered by temperature or photoperiod.

3460 Long, J. A. & Bashaw, E. C.
Microsporogenesis and chromosome numbers in St. Augustinegrass.
Crop. Sci. 1961 : **1** : 41–43.

The *Stenotaphrum secundatum* material studied comprised the common yellow-stigma type, a medium-textured purple-stigma type and a coarse-textured purple-stigma type; these were found to be diploid ($2n = 18$), triploid (27) and tetraploid (36) respectively. In the diploids there were always 9 bivalents and disjunction was normal; pollen viability approached 100%. In the triploids there were generally 3 trivalents and 9 bivalents and considerable variation was observed in chromosome disjunction; lagging chromosomes were noted at anaphase I and II and microspores were formed which contained micronuclei or, occasionally, no nuclear component at all. Sterility was common in this group. The most frequent configuration in the tetraploids was $4_{VI} + 10_{II}$; meiotic behaviour at anaphase I was almost normal with a high frequency of cells showing 18 chromosomes moving to each pole. Nevertheless sterility was high in these plants.

3461 Schaaf, H. M. & Rogler, G. A.
Selecting green needlegrass for low-dormancy seed.
Agron. J. 1960 : **52** : 704–07.

This study of *Stipa viridula*, now described in full, has been briefly reported elsewhere [XXX, 1258].

3462 Abele, K.
Cytological studies in the genus *Danthonia*.
Trans. roy. Soc. S. Aust. 1959 : **82** : 163–73.

Counts of 24, 42, 48, 72 and 96 somatic chromosomes were recorded in a group of 28 Australian species of *Danthonia*. A study of stomatal lengths showed that this character was, in the case of most species, highly correlated with the level of polyploidy. Higher levels of ploidy were also associated with increased hairiness of the lemma, except in the case of *D. linkii*, *D. carphoides* and *D. procera*. No other conspicuous morphological character showed any relationship with the level of ploidy. *D. caespitosa* ($2n = 24$, 48 and 72) and *D. longifolia* ($2n = 24$ and 48) showed intraspecific polyploidy. The distribution and the interspecific relationships of polyploidy levels in *Danthonia* are reviewed.

3463 Hutton, E. M.
Inter-variety variation in Rhodes grass (*Chloris gayana* Kunth).
J. Brit. Grassl. Soc. 1961 : **16** : 23–29.

The characters of 25 African varieties of *Ch. gayana* were studied at Brisbane, Australia, with a view to improving Australian Commercial. Fifteen of the varieties were tetraploid ($2n = 40$) while the remainder were diploid ($2n = 20$). The diploid varieties were, in general, finer-leaved, earlier maturing and more frost tolerant than were tetraploid lines. The results of yield trials showed that only the Rhodesian diploid Katambora and a Kenyan tetraploid, CPI17757, possessed a higher yield potential than Commercial. Cytological studies indicated that Rhodes grass may reproduce apomictically. Caryopses showed relatively high resistance to γ irradiation; a dosage rate of 107,000 r. reduced germination but the vigour of the surviving seedlings was normal.

3464 **Summit crested wheat released in Canada.**
Crops & Soils 1961 : **13** : No. 5 : 18–19.

[Cf. XXIV, 3059].

3465 Harlan, J. R. & Kneebone, W. R.
Woodward sand bluestem: origin, description and adaptation.
Bull. Okla. agric. Exp. Sta. 1960 : No. B–561 : Pp. 10.

[Cf. XXVII, 1882].

3466 Daubenmire, R.
An experimental study of variation in the *Agropyron spicatum* - *A. inerme* complex.
Bot. Gaz. 1960 : **122** : 104–08.

Progenies of rhizomatous and caespitose individuals of the above complex from a locality in Washington State were genetically differentiated with respect to the rhizomatous habit. This character probably has competitive advantage in the dense vegetation of habitats which are not very droughty. Selection pressure thus results in pure populations of the rhizomatous biotype in such environments, and in pure populations of the caespitose biotype in drier

habitats. It is proposed to include "*A. inerme*" in *A. spicatum* because the former is distinguished from the latter only by its awnless condition, awn lengths completely intergrade, and the differentiation of rhizomatous *v.* caespitose habit cuts across both groups.

LEGUMINOUS FORAGE PLANTS

3467 Pavlík, L.
Výskum slovenských krajových odrôd lucerny siatej a d'ateliny lúčnej, ich podchytenie, preskúšanie a množenie. (**An investigation of the Slovakian land varieties of lucerne and red clover, their registration, testing and multiplication**).
Sborn. čsl. Akad. zeměd. Ved : Řada rostlinná Výroba 1961 : **34** : 7–34.
The performance of 25 populations of lucerne and 36 of red clover was tested in several districts in Czechoslovakia and some varieties were found to be significantly superior to the standards.

3468 Lagerquist, R.
Stamförsök med lusern. (**Strain trials of lucerne**).
Medd. Jordbruksförs. 1960 : No. 114 : Pp. 56.
Data on the yield of hay in the first, second and third cuts and in leys of successive years are given for strains tested in different regions of central and southern Sweden during 1951–59, together with information on regenerative capacity.

3469 Wilsie, C. P.
Alfalfa varieties *versus* crosses, blends and hybrids.
Crops & Soils 1961 : **13** : No. 4 : 7–9.
Preliminary information is provided on the results of forage yield trials, involving individual varieties, intervarietal crosses and varietal mixtures, conducted at nine centres in the USA. Neither crosses nor mixtures were superior to individual varieties. The highest yielding varieties were Atlantic, Vernal and Narragansett. In a number of trials, Vernal showed greater resistance to leaf diseases and winter conditions than Ranger.

3470 **Wild alfalfa offers breeding potential.**
Crops & Soils 1961 : **13** : No. 5 : p. 17.
A vigorous purple-seeded hybrid has been developed at the University of California from crosses between a wild diploid lucerne and a cultivated tetraploid variety.

3471 Palmer, T. P.
Winter growth of lucerne (*Medicago sativa*). II. Genetic variation in a population of Hunter River lucerne.
NZ J. agric. Res. 1960 : **3** : 641–46.
Winter growth was studied in a population of 98 unselected plants from a locality in New Zealand and in the polycross progenies of 85 of these, determinations being made of the lengths of the longest stem per plant at different times and of green weight. Heritability estimates and estimates of additive genetic variance were high for both measurements. Further analysis of the data indicated that selection for mean length of stem on the basis of parental phenotypes would have been as effective as selection according to progeny performance. In the case of green weight, however, selection of parental plants would have been of very little use and a progeny test would have been essential. A small significant negative correlation was detected between initial length and growth increments in the whole population of the parents. With this population divided into upper and lower fractions for final stem length, initial lengths and growth increments were strongly and negatively associated in both fractions. These relationships between initial length and growth rate are discussed with reference to their bearing upon selection. [Cf. 586].

3472 Pedersen, M. W.
Utah Synthetic C is superior new alfalfa.
Crops & Soils 1961 : **13** : No. 4 : p. 18.
An attempt is now being made to combine the high seed-producing potential and disease resistance of Utah Synthetic C with the resistance to *Therioaphis maculata* and *Ditylenchus dipsaci* of Lahontan [cf. XXX, 1252].

3473 Zeiner, W. F.
Die züchterische Bearbeitung der Luzerne in Südafrika. (**The improvement of lucerne by breeding in South Africa**).
Saatgutwirtschaft 1961 : **13** : 43–44.
In this general account, mention is made of the variation observed in some important characters and of the correlation between characters.

3474 PARRINI, P.
Sulla possibilità di differenziazione e descrizione di alcuni ecotipi di *Medicago sativa* L. coltivati in Italia. **(On the possibility of differentiating and describing some ecotypes of *M. sativa* L. cultivated in Italy).**
Sementi elette 1960 : **6** : No. 6 : 36–42.
Various measurements of the seed and plant parts were made on eight ecotypes grown in Padua in 1957 and 1958. That from Polesine had the largest seeds, while the cultivar CIV from the Netherlands had the lowest number and diameter of internodes, shortest leaflets, largest number of leaves, shortest stature and slowest recovery in spring. This cultivar proved more homogeneous than the Italian ecotypes examined.

3475 LESINS, K. & LESINS, I.
Some little-known *Medicago* species and their chromosome complements.
Canad. J. Genet. Cyt. 1961 : **3** : 7–9.
Morphological and caryotypical observations are reported on *M. sauvagei*, *M. aschersoniana*, *M. lanigera*, *M. daghestanica* and *M. pironae*. The chromosome number in each species was $2n = 16$.

3476 LESINS, K. & LESINS, I.
Sibling species in *Medicago prostrata* Jacq.
Canad. J. Genet. Cyt. 1960 : **2** : 416–17.
Collections of *M. prostrata* from northern Italy were diploid ($2n = 16$), whereas a collection of this species from the Kovacov hills in southern Slovenia proved to be tetraploid ($2n = 32$).

3477 MALEEVA, Z. P.
(Embryo sac and pollen viability of lucerne sown at different dates).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 265–72. [Russian].
The development of the fertilized ovule in lucerne is described and illustrated. No signs of degeneration were observed either in plants from seed sown in the spring or in those sown in summer, though the seed yield was significantly higher in the latter.

3478 CLEMENT, W. M. (JUN.) & STANFORD, E. H.
A mechanism for the production of tetraploid and pentaploid progeny from diploid x tetraploid crosses of alfalfa.
Crop. Sci. 1961 : **1** : 11–14.
Observations on microsporogenesis in a dihaploid *Medicago sativa* plant with 16 chromosomes [cf. XXIX, 1634] revealed unequal partitioning of the nuclei at the tetrad stage resulting in microspores with 2, 3 and sometimes 4 nuclei as well as uninucleate microspores. At maturation, most of the functional gametes contained 16 or 24 chromosomes and gave rise to tetraploid and pentaploid progenies in crosses with tetraploid lines. When the dihaploid was used as female in the reciprocal cross, similar results were obtained, suggesting that a similar disturbance occurs on the female side. Two diploid F_1s from a dihaploid x diploid *M. falcata* cross were heterozygous for a dominant gene *Cp*, producing purple specks on the calyx of the flower buds; on crossing these as females with tetraploid *M. sativa* homozygous for the recessive allele, tetraploid plants were produced which segregated in the ratio 25 with specks : 11 without. It is considered that, in the diploid F_1s, restitution occurs on the female side after anaphase II. Microsporogenesis was almost normal in diploids from crosses of dihaploids with diploid *M. sativa* and *M. falcata* and also in dihaploids which were colchicine treated to double the chromosome number.

3479 MULJARČUK, S. A.
(The prospects of utilizing some wild lucerne species).
Agrobiologija (Agrobiology) 1959 : No. 6 : 939–41. [Russian].
Medicago tianshanica, originating from the Tien Shan, and *M. glutinosa* x *M. coerulea*, both from the Caucasus, were productive of highly nutritious hay in Ukrainian introduction trials. *M. tianshanica* and *M. glutinosa* reproduce well vegetatively and cross readily with other lucernes, including the above hybrid, giving rise to heterotic hybrids.

3480 KEHR, W. R.
General and specific combining ability for four agronomic traits in a diallel series among six alfalfa clones.
Crop. Sci. 1961 : **1** : 53–55.
The six clones used in this study were selected for their high general combining ability in respect of forage yield; they were unselected for growth habit and rate of recovery after cutting. The estimated variance component for general combining ability was slightly larger than that for specific combining ability in the case of autumn growth habit and rate of recovery, but that for specific combining ability was much larger than that for general combining ability

in the case of forage yield and spring growth habit. Thus, additive gene action appears to be more important than nonadditive action in determining differences in autumn growth habit and rate of recovery, while nonadditive gene action is more important in determining differences in the other two characters. Heritability estimates for spring and autumn growth, rate of recovery and forage yield were 71, 58, 85 and 58% respectively. With regard to the commercial production of lucerne crosses taking advantage of specific combining ability, it is suggested that 2-clone combinations offer the most promise.

3481 Lubenec, P. A.
(Methods of breeding and evaluating lucerne varieties for resistance to diseases).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 46–48. [Russian].
An outline is given of breeding lucerne for disease resistance.

3482 Lubenec, P. A.
(Breeding lucerne varieties resistant to disease).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 251–64. [Russian].
Various bacterial and fungal diseases known to attack lucerne in the Soviet Union and in North America are referred to, with data on the amount of damage they occasion. Some of the disease-resistant varieties produced in the USA are referred to and a plea is made for more attention to be given to this aspect in breeding and seed production of lucerne in the USSR.

3483 Oshri, A. ['A.]
(Susceptibility of lucerne varieties to leaf diseases).
Sadeh(Field)/Hassadeh 1960 : **41** : 26–29. [Hebrew].
The resistance of nine lucerne varieties to three fungal diseases was studied at Rehovot, Israel. Caliverde, Rambler and du Puits were moderately resistant to rust, *Uromyces striatus*. High resistance to *Peronospora trifoliorum* was noted in Rambler, Nomad, Rhizoma and Holandit [Dutch]; Moapa was moderately resistant to this pathogen. Du Puits appeared to be immune to common leaf spot, *Pseudopeziza medicaginis*, while Holandit, Rambler, Nomad and Rhizoma showed moderate resistance.

3484 Dudley, J. W. & Hanson, C. H.
Interrelations among characters in F_2 progenies from crosses between creeping-rooted and hay-type alfalfa clones.
Crop Sci. 1961 : **1** : 59–63.
Data on the creeping-root habit were reported in an earlier paper [cf. XXX, 2767]. Using the same material, the following characters were studied: leaf width and length, procumbence, plant height and width, incidence of *Uromyces striatus* and *Pseudoplea briosiana*, spring growth, crown width, recovery after cutting and plant weight. The interaction of creeping x hay type parents was significant only for plant width, leaf width and leaf length, indicating that for most of the characters general combining ability is more important than specific combining ability at this stage of the breeding programme. Highly significant components of variance associated with variation among F_1s within crosses were found for all characters, indicating that it should be possible to make genetic advance by selection among the F_1s.
All possible phenotypic correlations among the eleven characters were computed for the sources of variation associated with hay-type parents, with F_1s within crosses and with plants within plots. The three possible correlations among the three measures of plant height (total plant height, spring growth and recovery after cutting) were positive and highly significant for all three sources of variation. Correlations between plant width and yield, leaf width and leaf length, and crown width and procumbence were also significant and positive for all three sources of variation.
"Among F_1s within crosses and among plants within plots plant width was significantly positively correlated with spring growth, recovery, crown width, procumbence score, and leaf length. First cut yield was significantly positively correlated with spring growth, recovery, crown width, leaf width and leaf length, and significantly negatively correlated with leaf spot score.
"Significant positive correlations of leaf spot score with plant height, spring growth, and recovery, and significant negative correlations of spring growth with crown width, procumbence with leaf width, and leaf spot with crown width and procumbence were found only among hay-type means.
"Positive significant correlations found only among plants within plots included leaf width with plant height, spring growth, recovery and plant width, plant width with plant height,

yield with plant height and procumbence, and leaf length with plant height.
"Rust score was not significantly correlated with any of the other characters for any of the sources of variation."
Genotypic correlations were computed for the sources of variation associated with the hay-type parents and with F_1s within crosses. In general the genotypic correlations were similar to the phenotypic correlations in sign and magnitude.

3485 Bartoš, J. & Avratovščuková, N.
Staining of chromosomes in root tips of clover *in toto* with aceto-gallocyanine.
Biol. Plant., Praha 1960 : **2** : p. 246.
A solution of gallocyanin in a chromium mordant in dilute acetic acid stains chromatin structures blue to blue-black; other structures show as either colourless or light grey.

3486 Nüesch, B.
Einige wichtige Resultate aus Beobachtungen an Rotklee-Einzelpflanzen verschiedener Sorten. (**Some important results from observations on single plants of red clover of different varieties**).
Mitt. Schweiz. Landw. Zürich-Oerlikon 1960 : **8** : 145–55.
At Zürich-Oerlikon it was found that the native alpine clover provided the best material for breeding an early, multiple-cut variety with a good capacity for survival. Some of the other varieties studied also had useful characters.

3487 Anderson, L. B.
Evaluation of general and specific combining ability in a late-flowering variety of red clover (*Trifolium pratense* L.).
NZ J. agric. Res. 1960 : **3** : 680–92.
General (GCA) and specific (SCA) combining ability were determined for seasonal yields scored visually, habit (percentage of prostrate and semiprostrate plants), persistence (ability to recover after flowering in the first year) and time of flowering in diallel crosses of seven non-inbred plants of a late-flowering variety.
Significant differences in GCA and SCA were found for spring, summer and autumn yields and for the other three characters. SCA variances for visual estimates of yield in the three seasons were generally higher than GCA variances. GCA variances for habit, persistence and flowering were generally greater than SCA variances. Heritability estimates for all characters were high, particularly for autumn yield, habit, persistence and flowering. Evidence of genotype x environmental interactions in both GCA and SCA for seasonal yields was obtained. The value of the material for the development of a synthetic is assessed.

3488 Waller, E.
Svalöfs Hermesrödklöver. (**The Svalöf red clover Hermes**).
Sverig. Utsädesfören. Tidskr. 1960 : **70** : 263–70.
A detailed account of the above new variety is presented [cf. XXIX, 3529].

3489 Łączyńska-Hulewicz, T.
Selbstfertilität und Inzuchtdepression bei tetraploidem Rotklee. (**Self fertility and inbreeding depression in tetraploid red clover**).
Züchter 1960 : **30** : 219–22.
Tetraploid red clover was found to be considerably more self fertile than diploid, but artificial pollination was necessary [cf. XXX, 485]. This increased self fertility led to inbreeding depression in several characters. Some suggestions are made for avoiding inbreeding depression.

3490 Halifman, I.
(**Bees and clover**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1959 : No. 12 : 35–37. [Russian].
Research aimed at improvement of red-clover pollination by bees is surveyed. Soviet achievements include the successful training of bees with a short proboscis to frequent red clover fields, the breeding of clovers with shorter and wider corolla tubes and the convergent breeding of clovers with the required morphological characteristics and bees with long probosces. Reference is made to a hybrid between red and Alsike clovers obtained by pollination of the former with a pollen mixture from both species at Krasnoufimsk. It is a red clover, but has the aroma of the other species which attracts the bees. It is early and highly productive of hay and seed. Its corolla tubes are 1–1·5 mm. shorter than in the mother species and the nectar rises high in the tube.

3491 Britten, E. J.
The influence of genotype and temperature on flowering in *Trifolium repens*.
Agron. J. 1961 : **53** : 11–14.
Clones of collections made at various altitudes in Hawaii were studied in field tests at 21, 659, 1067 and 2051 m. At the two lower altitudes,

the clones showed considerable variation in flowering propensity, ranging from profuse flowering to none. At 2051 m., all the clones flowered. Pot experiments at 659 and 2051 m. confirmed the results of the field tests. In experiments in a controlled-environment cabinet, clones which failed to flower at low altitudes could be induced to flower by cold nights (8·3° C.) and warm days (25° C.). The practical significance of these results for breeding and seed production of white clover in tropical areas is indicated. [Cf. XXX, 4047].

3492 Britten, E. J.
Genetic-environmental control of flowering in *Trifolium repens*.
Proc. Hawaii. Acad. Sci. 1958–1959 : **34** : p. 1.

T. repens introduced in Hawaii occurs chiefly at altitudes above 2000 ft. In a collection of Hawaiian material, clonal differences in ability to flower and in abundance of flowers were observed at low altitudes. Clones unable to flower at low altitudes flowered at high altitudes or when artificially subjected to low night temperatures. Crosses have been made between flowering and "nonflowering" clones.

3493 Armstong, J. M. & Robertson, R. W.
Studies of colchicine-induced tetraploids of *Trifolium hybridum* L. II. Comparison of characters in tetraploid and diploid.
Canad. J. Genet. Cyt. 1960 : **2** : 371–78.

Tetraploid and diploid Alsike clovers were compared with respect to pollen diameter, stoma size, number of plastids in guard cells, height, tiller number, stem thickness, leaf area, seed size, flower size and floret number per head. The tetraploid surpassed the diploid in all these characters, with the exception of tiller number. Increased height, leafiness and stem thickness were responsible for the greater hay yield of the tetraploid. The two types were similar in winter hardiness but the tetraploid had greater persistence. The amount and sugar concentration of the nectar were slightly higher in the tetraploid but the differences were not significant. As shown by rate of seedling emergence, the tetraploid was less sensitive to the effect of X irradiation (10,000–40,000 r.) of the seed. At the higher doses, however, seedling mortality in the tetraploid was comparable with that in the diploid. Chemical differences between the $4x$ and $2x$ forms were negligible. In two field trials, the tetraploid was significantly superior to the diploid in hay yield. [Cf. XXVII, 631].

3494 Rossiter, R. C. & Millington, A. J.
Some characteristics of "Carnamah", a very early-flowering strain of *Trifolium subterraneum* L., when grown as single plants.
Aust. J. agric. Res. 1961 : **12** : 27–39.

A very early-flowering strain, now named Carnamah, was discovered in 1957 at Carnamah, Western Australia. When sown in the autumn-early winter period, it begins to flower 10–30 days before Dwalganup, the standard commercial early strain. With very early planting, during late March, the difference in time of flowering is about 45–50 days. The earliness in flowering of Carnamah is associated with early floral initiation. Rate of flower development (from initiation to the appearance of flowers) in relation to temperature was similar for Carnamah and Dwalganup. Under spaced-plant conditions, the total production of Carnamah was less than that of Dwalganup. The new strain was not readily distinguishable from Dwalganup, although several minor morphological differences were discernible. Its chromosome number was normal for the species ($2n = 16$). It is suggested that the new strain may be more effective than Dwalganup in extending the clover zone inland in southern Australia.

3495 Laumont, P.
La culture de la vesce-fourrage en Algérie. **(The cultivation of vetch in Algeria).**
Bull. Dir. Agric. For., Alger undated : No. 3 : Pp. 56.

Vetch varieties cultivated in Algeria are described. Tabulated data are provided on the productivity and maturity date, in different parts of Algeria, of six promising lines of the common spring vetch, namely Languedoc 159 and 225, Rumania 3226–2–II and 3232–3, Bulgaria 145 and Kabylia 130.

3496 Kalajdžieva, S.
(A new variety of spring vetch, M135/794).
Nauč. Trud. nauč.-izsled. Inst. Furažite (Sci. Proc. sci.-res. Inst. For.), Pleven 1959 : **1** : 19–26 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 93 : p. 65. [Bulgarian]. (Mimeographed).

This variety, developed from Macedonian material at Plovdiv, gives an average yield of 4765 kg. per ha. of hay and 1790 kg. per ha. of seed, thereby considerably outyielding the standard variety B–61. Its 1000-seed weight is 63·5 g. and the dry matter consists of 36·4%

crude protein and 31·8% pure protein. The vegetative period is 103–115 days; M135/794 has average resistance to drought and is also resistant to pests and diseases.

3497 Suvorov, V. V., Štan'ko, K. T. & Kiseleva, S. D.
(On the classification of *Vicia villosa* Roth.).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 273–78. [Russian].

Both spring and winter forms are described, some of the spring forms being cold resistant and others not. A semiwinter form is also described.

3498 Majewski, A.
Badania nad łubinem wieloletnim (*Lupinus polyphyllus* Lindl.) [**Studies on perennial lupin (*L. polyphyllus* Lindl.)**].
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 431–48.

Advantages of *L. polyphyllus* compared with other species include the low toxicity (0·08% alkaloids in the dry matter) of the nonbitter plants found in wild populations in Poland, its suitability for hay and its adaptation to varied soil types. The variability in alkaloid content, shattering resistance and growth rate allows desirable forms to be isolated; biotypes with a tendency towards self pollination, likely to be useful in breeding, also appear to occur.

3499 Datta, R. M. & Sen, S. K.
Interspecific hybridization between *Sesbania aculeata* Pers. (4n race) and *S. speciosa* Taub. ex Engler (2n race) and cause of failure of viable seed-formation.
Züchter 1960 : **30** : 265–69.

No viable seeds were obtained from either *Sesbania speciosa* (2*n*) ♀ x *S. aculeata* (4*n*) ♂ or the reciprocal cross. The ploidy ratio between maternal tissue, endosperm and embryo was 2*n* : 4*n* : 3*n* in the first cross and 4*n* : 5*n* : 3*n* in the reciprocal. Defective seed development is attributed partly to ploidy relations and partly to genomic differences between the species.

3500 Arya, H. C.
On the occurrence of physiological strains in *Myrothecium roridum*.
Indian Phytopath. 1959 : **12** : 164–67.

Five strains of *M. roridum*, a pathogen on *Cyamopsis tetragonoloba* and other species, are identified on the basis of pathological and cultural variations.

ROOTS AND TUBERS

3501 Opsahl, B.
Forsøk med stammer av fôrbeter 1956–1959. **(Trials of strains of fodder beets, 1956–1959).**
Forskn. Fors. Landbr. 1960 : **11** : 587–605.

Details of yield, dry-matter content, bolting percentage, storage quality and other characters are given for 12 sugar mangels, three mangels and two sugar beets for fodder tested in Norway. Under conditions of high precipitation, varietal differences in performance and competitive ability were detected, with polyploids > diploids, sugar mangels > sugar beets and sugar beets > mangels low in dry matter content.

3502 Forsøg med stammer af foderbeder. **(Trials of strains of fodder beets).**
Tidsskr. Planteavl 1960 : **64** : 725–28.

[Cf. XXX, 2800].

3503 Voederbieten, 1961. **(Mangels, 1961).**
Landbouwvoorlichting 1961 : **18** : Bijl. 85; Ber. Rassenkeuze No. 302 : Pp. 5.

Details of bolting resistance, ease of lifting and fresh and dry yields are given for 49 varieties tested in the Netherlands during 1957–60.

3504 Dimitrijević, R.
Uporedni ogledi s polušećernim sortama stočne repe. **(Comparative trials of half sugar-beet varieties).**
Arh. poljopr. Nauk. 1960 : **13** : No. 39 : 3–16.

Sixteen varieties were tested in 11 European countries for productivity under semiarid conditions. Drought resistance was highest in Voedersuikerbeit CB [Fodder sugar beet CB] from Holland, Husby 333/48 from West Germany and Pajbjerg Korsroe XI [Pajbjerg Cross beet XI] from Denmark. The varieties giving the highest yields of roots were Husby 333/48, Solid from Sweden and Red Øtofte and Yellow Dæno XI from Denmark. The best dry-matter yields were given, in descending order, by Solid, Voedersuikerbiet CB, Red Øtofte XI, Pajbjerg Rex XI, Yellow Dæno XI and Husby 333/48.

3505 Baumgart, K.
Cechy morfologiczne potomstwa brukwi i rzepy zapylanej pyłkiem innych form z rodzaju *Brassica*. **(Morphological characters of the progeny of swede and turnip pollinated with pollen of other forms of the genus *Brassica*).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 411–29.

Hybrids of turnip ♀ with swede ♂, winter swede

rape ♂ and summer swede rape ♂ have been obtained by open pollination; they are more vigorous in growth than the parents and resemble the male parent in form. Swede, which has a strong tendency towards self pollination, failed to cross with turnip ♂ or winter turnip rape ♂. The intraspecific crosses swede ♀ x winter swede rape ♂ and turnip ♀ x winter turnip rape ♂ were successful and were more fertile than the interspecific hybrids. The hybrids were more susceptible to downy mildew than the progenies from selfing.

3506 Świeżyński, K.
Selekcja ziemniaków na cechy użytkowe. Cz. III. Selekcja na plenność i wczesność tuberyzacji. (**Selection of potatoes for useful characters. III. Selection for productivity and earliness of tuber formation**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 229–73.

Data are given on the performance of seedlings from 17 intervarietal crosses studied in Poland. On the average, the seedling clones differed little in yield from commercial varieties. Within any one cross, the clones with the highest yields in autumn emerge earlier, show greater vigour, give higher July yields and have a longer vegetative period than the average of all the clones of the cross. Those clones with the highest July yields show a similar superiority to the average but have a shorter vegetative period. A correlation was found between the early yields of the seedling plants grown under long days and the July yields of the lines obtained from them. The correlation diminishes in seedlings grown under short days.

3507 Csák, Z.
Burgonyakísérletek 1957–1959. évi eredményei. (**Potato trial results, 1957–1959**).
Magyar Mezőgazdaság, Budapest 1960 : **15** : 12–13 : from Hungar. agric. Rev. 1960 : **9** : No. 3 : p. 11. (Abst.).

In trials of Hungarian and introduced varieties conducted at 14 localities in Hungary, the most productive varieties in the early, medium early, medium late and late classes were, respectively, Sárga Kifli [Yellow Kidney], Somogyi Sámson, K263 and Capella (= Lenino).

3508 Création de nouvelles variétés. (**The development of new varieties**).
Pomme d. Terre franç. 1961 : **24** : No. 257 : 20–21.

The standard technique for the production of a new potato variety is described briefly. Varieties bred in France between 1948 and 1961 are listed.

3509 Kogtev, P. P.
(**The varietal field station, an agricultural centre of the village**).
Kartofel' (Potato), Moskva 1959 : No. 6 : 53–55. [Russian].

This account of potato varietal trials on a farm in the province of Jaroslavl' mentions two early table varieties with high yields and resistance to *Synchytrium*. Falenki is the earlier of the two, but the other, Petrovskij, is resistant to *Phytophthora* as well as to wart.

3510 Aardappels, 1961 (Observatieproefvelden). [**Potatoes, 1961 (observation trial fields**)].
Landbouwvoorlichting 1961 : **18** : Bijl. 87; Ber. Rassenkeuze No. 304 : Pp. 4.

Data on tuber yield, dry-matter content, dry-matter yield and earliness are given for 41 varieties, comprising some which have already been admitted to the Netherlands varietal list and others which are still at the preliminary testing stage.

3511 Stroun, M. & Mathon, C. C.
Variations orientées de bourgeons de pomme de terre (*Solanum tuberosum*). [**Directed variations of potato buds (*S. tuberosum*)**].
Ber. Schweiz. bot. Ges. 1960 : **70** : 141–49.

Tubers which developed from buds completely isolated from the parent tuber showed variations in colour, whilst plants developed from entire tubers produced daughter tubers of the maternal type. In this case the variations cannot be explained on the basis of a periclinal chimera; the periclinal-chimera hypothesis is also rejected for adventitious buds which show similar modifications.

3512 Murphy, H. J., Goven, M. J., Schark, A. E. & Blood, P. T.
Maine - New Hampshire potato variety trials for 1960.
Misc. Publ. Me. agric. Exp. Sta. 1961 : No. 644 : Pp. 45.

Tabulated data are provided on the yield, disease resistance, growth characteristics, dry-matter content and suitability for crisp and chip making of commercial varieties and newly developed seedlings.

Reunión de Comunicaciones sobre Papa. **(Symposium on the potato).**
Idia 1960 : No. 2 : Suppl. : Pp. 67.

The following papers were presented at a conference on potato improvement held at the Agricultural Experiment Station, Balcarce, Argentina, between 26–30 January, 1960.

3513 *Pasquale, D., Induni, C. J., Garay, O. & Calderoni, A. V. Mejoramiento de la papa en Balcarce.* (*Potato improvement at Balcarce*). (*pp. 1–3*).

The aims and methods of the potato breeding programme at Balcarce are described. Lines possessing resistance to common scab, leaf roll and *Fusarium* spp. have been selected.

3514 *Garay, O., Induni, C. J., Pasquale, D. & Calderoni, A. Ensayo comparativo de rendimiento con clones de la Estación Experimental Agropecuaria de Balcarce.* (*A yield trial of clones of the Balcarce Agricultural Experimental Station*). (*pp. 3–5*).

Among lines which consistently performed well in trials conducted between 1955 and 1958 were Huinkul, B 10.50D, B 25.50E, B 25.50B, B.Acc.1–50 and P 07–49.

3515 *Garay, O. A. Comportamiento de los clones de la Estación Experimental en chacras de la región sudeste.* (*Performance of the Experimental Station clones on farms of the southeast region*). (*pp. 5–6*).

Huinkul and Santa Rafaela (B.Acc.1–50) gave better results than other lines in tests conducted at seven centres.

3516 *Calderoni, A. V. Comportamiento al virus leaf-roll en los clones seleccionados en la Estación Experimental Agropecuaria de Balcarce.* (*Response to leaf roll of clones selected at the Balcarce Agricultural Experimental Station*). (*pp. 8–9*).

A number of clones showed some resistance to leaf roll.

3517 *Calderoni, A. V. Sarna común de la papa.* (*Potato scab*). (*p. 10*).

Seven clones, selected at Balcarce for resistance to *Streptomyces scabies*, are listed.

3518 *Calderoni, A. V. Fusariosis o marchitamiento de la papa.* (*Potato fusariosis or wilt*). (*pp. 10–11*).

Among lines which have shown useful resistance to *Fusarium* (*Hypomyces*) *solani* are Johansen, Pontiac, Pungo, F50–30 and F4776.

3519 *Induni, C. J. Comportamiento de padres.* (*Performance of parents*). (*pp. 11–12*).

Lines which performed well as ♂ and ♀ parents were Harford, Alma, Merrimack, Teton, B773–39, B10.50, B29.52 and 528–170.

3520 *Costa, D. M. da & Liberal, M. T. Alguns aspectos do melhoramento da* Solanum tuberosum *L., no Instituto Agronômico do Sul.* (*Some aspects of* S. tuberosum *improvement at the Agronomic Institute for the South*). (*pp. 12–13*).

S. demissum, Kennebec and clone 96–56 are being used in the development of blight-resistant varieties. Early maturing lines being utilized in the breeding programme are *S. rybinii*, *S. tarijense*, Benedikta and Eigenheimer.

3521 *Costa, D. M. da Competições entre variedades da batata realizadas pelo Insituto Agronômico do Sul, no Rio Grande do Sul.* (*Potato variety trials conducted by the Agronomic Institute for the South, Rio Grande do Sul*). (*pp. 13–15*).

Varieties which performed well in trials at nine centres are listed.

3522 *Costa, D. M. da & Liberal, M. T. O* Phytophthora infestans (*Mont.*) *de Bary e raças que ocorrem no Instituto Agronômico do Sul.* [Ph. infestans (*Mont.*) *de Bary and races which occur at the Agronomic Institute for the South*]. (*p. 15*).

The following races have been identified: 0; 1; 2; 3; 4; 1,2; 1,3; 1,4; 2,3; and 3,4.

3523 *Liberal, M. T. Algumas considerações sôbre a resistência da batata americana* (Solanum tuberosum *L.*) *ao* Phytophthora infestans (*Mont.*) *de Bary.* [*Some observations on the resistance of potato* (S. tuberosum *L.*) *to* Ph. infestans (*Mont.*) *de Bary*]. (*pp. 15–16*).

Resistance to specific races of *Ph. infestans* and polygenic resistance to late blight are both being

utilized in the potato-breeding programme in Rio Grande do Sul.

3524 *Guimarães, F. F., Luz, N. K. & Nova Cruz, C. A. R. da. Estado atual dos trabalhos de melhoramento em batata americana* (Solanum tuberosum *L.*), *visando obtenção de resistência ao fungo* Phytophthora infestans (*Mont.*) *de Bary, conduzidos na Estação Experimental de Horticultura, Secretaria de Agricultura, Indústria e Comércio, Domingos Petrolini, Rio Grande, R.G. Sul.* [*The current stage of work on the improvement of the potato* (S. tuberosum *L.*), *designed to develop resistance to the fungus* Ph. infestans (*Mont.*) *de Bary and conducted at the Horticultural Experiment Station, Bureau of Agriculture, Industry and Commerce, Domingos Petrolini, Rio Grande, Rio Grande do Sul*]. (*pp. 16–17*).

A large number of intervarietal and interspecific crosses have been made. The material being used includes *S. demissum, S. rybinii* and the North American clones 96–56, HLT–4, B922X and B929–32. The following races of *Ph. infestans* have been identified at the station: 0; 1; 3; 4; 1,4; 2,3; and 3,4.

3525 *Viirsoo, E. V. & Ploper, J. Nota sobre la aplicación de distintas especies de* Solanum *para el mejoramiento de papa cultivada.* (*Note on the utilization of different* Solanum *species for the improvement of the cultivated potato*). (*pp. 18–22*).

In this review reference is made to early as well as recent attempts to transfer disease resistance and other valuable characteristics from wild species to *S. tuberosum.*

3526 *Bazán de Segura, C. Investigaciones fitopatológicas sobre la papa en el Perú, 1959.* (*Phytopathological investigations on potato in Peru during 1959*). (*pp. 23–24*).

All races of *Phytophthora infestans* which have thus far been identified in Peru are listed.

3527 *Fernández Valiela, M. V. Virus, incidencia e importancia en el cultivo de papa.* (*The incidence and importance of viruses in potato cultivation*). (*pp. 31–34*).

Varietal differences in the percentage of plants infected with virus diseases were observed at La Consulta Experiment Station.

3528 *Fernández Valiela, M. V. Variaciones en el comportamiento a* Phytophthora infestans *en dos años de observaciones en el delta del Paraná, de algunas variedades de papas.* (*Variations in the response of some potato varieties in the Paraná delta to* Ph. infestans *in two years of observation*). (*p. 35*).

In 1958, Kennebec, Pungo, Saco and Cherokee showed high susceptibility to late blight. These varieties have previously been reported to be highly resistant to the disease.

3529 *Induni, C. J. Pruebas de variedades de papa en Balcarce.* (*Potato varietal trials at Balcarce*). (*pp. 40–41*).

Among varieties that performed well in trials conducted between 1954–1958 were Huinkul, Fina, Linda, Luna, Sabina, B26.50F and B10.50K.

3530 *Crnko, J. & Laborde, L. J. Comportamiento, en la Estación Experimental Agropecuaria de La Consulta, de las 25 variedades cultivadas de papa y 10 nuevos clones obtenidos en la Estación Experimental Agropecuaria de Balcarce.* (*The performance at La Consulta Agricultural Experiment Station, of 25 cultivated varieties and 10 new clones produced at Balcarce Agricultural Experiment Station*). (*pp. 44–46*).

Up-to-date and Majestic performed well in trials held at La Consulta between 1953–1958. Other varieties which gave good results were Kennebec, Huinkul, Saco, Sequoia, Toni, Ackersegen, B10.50D, B10.50J and B25.50E.

3531 Aardappels, 1961 (interprovinciale proefvelden). [**Potatoes, 1961 interprovincial trial fields**)]. Landbouwvoorlichting 1961 : **18** : Bijl. 86; Ber. Rassenkeuze No. 303 : Pp. 7.

Data on tuber yield, dry-matter content, dry-matter yield and earliness are presented for 56 Netherlands varieties tested since 1950, together with descriptive notes on individual varieties. The new variety Extase [Ecstasy] has given good yields on fertile soils, is very resistant to blight, shows little susceptibility to virus Y and has well-shaped tubers of good quality.

3532 Petrović, D.
Činioci generativne plodnosti krompira i mogućnost njegove hibridizacije. (**The conditions affecting berry formation in potatoes and the prospects of hybridization**).
Savremen. Poljopr., Novi Sad 1959 : **7** : 1018–27.

In experiments carried out at Guča, the flowering of potatoes was promoted by grafting on tomato or planting the tubers on stones. The variety Apta gave good results as pollen parent in several crosses, the best of these being a cross with Early Rose. Other varieties also gave good results as the female parent. External conditions had considerable influence on the success of the crosses.

3533 van Vliet, W. F., Schriemer, W. H. & Buitenweg, H.
Sugar accumulation in potatoes at low temperature, studied in crosses between Western European (Dutch) varieties and South American varieties of *Solanum tuberosum*.
Europ. Potato J. 1961 : **4** : 87–92.

The content of reducing and nonreducing sugars in five European *S. tuberosum* ssp. *tuberosum* varieties, and in crosses between these varieties and South American *S. tuberosum* ssp. *andigenum* lines, all stored at a temperature of 2° C., was estimated. The favourable property of very low accumulation of reducing sugars characteristic of Maritta was largely lost in crosses involving that variety. In most of the other crosses, the sugar content was similar to or lower than that of the European varieties involved.

3534 Lipińska, J., Glück, J. & Dzierżanowska, W.
Zdolność krzyżowania się dzikich i uprawnych gatunków ziemniaka między sobą i z *S. tuberosum*. Wyniki dwuletnie). [**The crossing ability of wild and cultivated potato species *inter se* and with *S. tuberosum*. (Two years' results)**].
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 353–71.

Interspecific cross pollinations were effected at the Institute of Plant Breeding and Acclimatization, Poland, in 1958 and 1959, the chief species used being *Solanum antipoviczii*, *S. stoloniferum*, *S. vernei*, *S. macolae*, *S. rybinii*, *S. andigenum* and *S. tuberosum*. Fruit set failed in about half the crosses and varied between 0·5 and 5% in most of the remainder, reaching 21 and 47% in two instances only. Seed set was low and in some crosses only parthenocarpic fruits were set. The most successful parents were *S. rybinii* and *S. stoloniferum*, the former generally giving seed whether used as male or female parent, the latter only when used as male. Some of the hybrids were crossed with *S. tuberosum* varieties or with other hybrids, but out of 14 such crosses only (*S. chacoense* x *S. rybinii*) x (*S. simplicifolium* x *S. rybinii*), (*S. chacoense* x *S. rybinii*) x (*S. rybinii* x *S. vernei*) and (*S. commersonii* x *S. rybinii*) x (*S. simplicifolium* x *S. rybinii*) set seed.

3535 Malheiros-Gardé, N.
Fertilization and seed development in some crosses between diploid species of the genus *Solanum*.
Agron. lusit. 1959 : **21** : 91–102.

Seed failure occurred in *S. verrucosum* x *S. jamesii*, *S. verrucosum* x *S. pinnatisectum*, *S. verrucosum* x *S. ehrenbergii*, *S. jamesii* x *S. soukupii*, *S. jamesii* x *S. simplicifolium*, *S. pinnatisectum* x *S. simplicifolium* and *S. pinnatisectum* x *S. soukupii*. The embryo was able to reach a many-celled stage but starved to death because of the abnormal development and subsequent collapse of the endosperm. Embryo and endosperm development were normal in *S. verrucosum* x *S. soukupii*.

3536 Trinkler, Ju. G.
(**The major cycle of development of the potato plant**).
Fiz. Rasten. (Phys. Pl.) 1960 : **7** : 730–33. [Russian].

A hypothesis on cyclic development of the potato is propounded and evidence that clones gradually decline as a result of vegetative reproduction is presented. Sexual reproduction is thought to be the only means to check the decline and it is therefore concluded that new varieties of potato which are adapted to multiplication by seed are needed.

3537 Spasojević, S.
Klon kao činilac u oplemenjivanju i kontrola klonske senilnosti u krompira. (**Clone as a factor for improvement and control of clonal senility in potato**).
Zborn. Rad. biol. Inst., Beograd 1957 : **1** : No. 1 : Pp. 23.

Potato clones in either early or late stages of degeneration were rejuvenated by the selection of tubers with healthy, young, vigorous sprouts. The various theories proposed to explain clonal

degeneration are discussed. The results obtained are in accordance with the senility theory; viruses are considered to play an important, but essentially secondary, role. Lysenko's suggestion that temperature effects are primarily responsible for degeneration is rejected.

3538 KELLER, E. R.
Die Veränderungen im schweizerischen Richtsortiment für den Kartoffelbau 1960/61. (**Changes in the Swiss official collection for potato cultivation 1960–61**).
Mitt. schweiz. Landw. Zürich-Oerlikon 1960 : **8** : 183–86.

Two new German varieties have been added to the official list. Cosima is a late variety originating from the cross (Sabina x Voran) x (*Solanum demissum* x Flava); it has white skin and yellow flesh. This variety gives a high yield of tubers and starch, the starch content varying between 16·5 and 17·5%; the tubers are rather floury when cooked. Cosima is resistant to wart and shows average resistance to *Phytophthora* in its foliage, the resistance of the tubers being also quite good. It is tolerant of leaf roll virus and its susceptibility to virus Y is quite low. Datura (Olympia x Aquila) is a medium-late variety with white skin and yellow flesh; it is resistant to wart and also shows quite good resistance to *Phytophthora* in foliage and tubers, is fairly tolerant of leaf roll virus and resistant to virus Y. The starch content of Datura varies between 16 and 17·5% and the cooked tubers are floury; this variety gives a good yield.

3539 RANJEL, C. E., HEIDRICK, L. & ESTRADA RAMOS, N.
Diacol-Cumbal una nueva variedad de papa. (**Diacol-Cumbal, a new potato variety**).
Agricultura trop. 1960 : **16** : 788–95.

In yield trials conducted at several centres in Nariño between 1957 and 1959, Diacol-Cumbal consistently outyielded Ojona, the outstanding local variety. The characteristics of the new variety are described in detail [cf. 3540].

3540 ESTRADA RAMOS, N.
Nuevas variedades de papa para Colombia y producción de semilla inspeccionada. (**New potato varieties for Colombia and the production of certified seed**).
Agricultura Trop. 1960 : **16** : 783–87.

Descriptions are given of Diacol-Monserrate, Diacol-Cumbal and Diacol-Guadalupe, three high-yielding *Solanum tuberosum - S. andigenum* crosses bred at the Tibaitatá Research Centre. Diacol-Monserrate is an early-maturing variety adapted to altitudes of 2000–2900 m. in the departments of Cundinamarca and Boyacá. Its tubers are of excellent quality and are particularly suitable for prolonged storage. The foliage is highly resistant to late blight but is susceptible to mild mosaic and virus Y. Diacol-Cumbal is a semilate variety suitable for cultivation in the department of Nariño at altitudes between 2000 and 3000 m. The foliage is resistant to late blight but is susceptible to mild mosaic. Diacol-Guadalupe is a semilate variety adapted to altitudes between 2200 and 3000 m. in the departments of Cundinamarca and Boyacá. Its tubers are of high quality and possess considerable resistance to storage rots. The variety is highly resistant to mild mosaic and moderately resistant to late blight but is slightly susceptible to virus Y. Alfa, a variety introduced from the Netherlands in 1952, is also described.

3541 NIKOLENKO, T. R.
(**Selecting and utilizing valuable local varieties**).
Kartofel' (Potato), Moskva 1959 : No. 6 : 50–52. [Russian].

Recent potato selections, comprising mostly land varieties from the Drogobyč, Stanislav and Transcarpathian provinces, are listed. They include early, midseason and late types which outyield the corresponding standard varieties by a good margin. Some are resistant to *Phytophthora* and *Synchytrium* and richer in starch and dry matter than the standards. Jablons'ka Rannja [Early Jablons'ka] has also higher contents of protein and vitamin C than the standard Priekul'skij Rannij [Early Priekuļi].

3542 LEBEDEVA, N. A. & LUKOVNIKOVA, G. A.
(**Changes in green weight, transpiration and chemical composition in potatoes on polyploidization**).
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 1363–65. [Russian].

Chromosome duplication resulted in increases in weight both of tops and of roots and tubers in *Solanum punae, S. antipoviczii, S. gibberulosum, S. demissum, S. verrucosum* and *S. phureja* but not in *S. tuberosum*, where the weight of tops and their dry-matter content diminished. The polyploid forms had a larger leaf surface

and their transpiration rate was higher in all species. In all species but *S. tuberosum* the polyploids had higher contents of starch, sugars, protein, ascorbic acid and chlorophyll in the leaves, and in at least two species the amylase content was higher too.

3543 Hougas, R. W. & Peloquin, S. J.
Crossability of *Solanum tuberosum* haploids with diploid *Solanum* species.
Europ. Potato J. 1960 : **3** : 325–31.
A detailed account is given of studies already briefly reported [cf. XXX, 515]. The 29 haploids, designated US–W1 to US–W29, were mostly used as female parents, but US–W1 and US–W4, which have high pollen fertility, were also used successfully as male parents in certain interhaploid and haploid-diploid crosses.

3544 Świniarski, E. & Mierzwa, Z.
Aktywność peroksydazy i tyrozynazy w kłębach *Solanum.* (**Peroxidase and tyrosinase activity in *Solanum* tubers**).
Hodowla roślin Aklimatyz. Nasiennictwo 1960 : **4** : 373–76.
Studies of peroxidase and tyrosinase activities in 16 species pertaining to six sections showed similarities within but not between sections. *S. polyadenium* displayed no tyrosinase activity in the tubers and little in the shoots. The virus-resistant species *S. rybinii* and *S. antipoviczii* also had little tyrosinase activity in the tubers. No relation between blight resistance and peroxidase activity could be detected.

3545 Wangenheim, K.-H. v., Peloquin, S. J. & Hougas, R. W.
Embryological investigations on the formation of haploids in the potato (*Solanum tuberosum*).
Z. VererbLehre 1960 : **91** : 391–99.
The cross 4*n* *S. tuberosum* 'Merrimack' ♀ x 2*n* *S. phureja* 'PI225682' ♂ was studied. It was found that, in this cross, only the hexaploid endosperm was likely to develop normally; only one pentaploid endosperm was found and this was developing much more slowly than the hexaploid endosperms of ovules taken from the same seed ball. The hexaploid endosperm appears to arise from the union of the tetraploid embryo-sac nucleus with two chromosome sets from the male; a process of double fertilization by gametes from unreduced pollen grains is considered more likely than the functioning of unreduced pollen. Haploid embryos arise when the egg cell remains unfertilized, although the unfertilized cell does not develop in every case, depending on its own constitution or on external influences. It is shown that endosperm development proceeds independently of embryo development, at least in the early stages, and is not affected by the chromosome number of the embryo; it is considered that endosperm degeneration in this cross is due to the constitution of the endosperm itself.

Vorträge der wissenschaftenlichen Jahrestagung 1959 des Instituts für Landtechnik Potsdam-Bornim der Deutschen Akademie der Landwirtschaftwissenschaften zu Berlin, 1959. (**Lectures given at the scientific annual general meeting of the Potsdam-Bornim Institute for Agricultural Technique of the German Academy of Agricultural Sciences, Berlin, 1959**).
Tagungsber. dtsch. Akad. Landwirtschaftsw. Berlin 1959 : No. 22 : Pp. 166.

3546 *Schick, R. Züchtung und Technik im Kartoffelbau.* (*Breeding and techniques in potato growing*). (*pp. 7–14*).
Concerned chiefly with factors affecting the efficiency of mechanical planting and harvesting, this article mentions the desirability of breeding varieties with round tubers with the eyes concentrated at the rose end; such varieties would facilitate mechanical harvesting and peeling. With regard to the considerable proportion of damaged potatoes resulting from mechanical harvesting, it is proposed that table varieties with a rather higher starch content should be used, damaged tubers of which would be suitable for fodder.

3547 Lampe, K.
Entwicklung und Erprobung einer Methode zur Bestimmung der Widerstandsfähigkeit von Kartoffelknollen gegen Beschädigungen. (**Development and testing of a method for the determination of the resistance of potato tubers to damage**).
Diss. landw. Fak. Univ. Giessen 1959 : Pp. 125.
This is a detailed account of work already summarized from other sources [XXX, 537 and XXXI, 643].

3548 Rothacker, D. & Vogel, J.
Untersuchungen am Sortiment wilder und kultivierter Kartoffelspecies des Instituts für Pflanzenzüchtung Gross-Lüsewitz (G–LKS). I. Über einige Speisequalitätsmerkmale verschiedener Kartoffelspecies und -herkünfte. [**Investigations on the collection of wild and cultivated potato species of the Institute for Plant Breeding, Gross-Lüsewitz (G–LKS). I. Some culinary quality characters of different potato species and provenance types**].
Züchter 1960 : **30** : 273–79.
The discoloration of raw and cooked tubers was assessed. No relationship was found between the discoloration and the original colour of the flesh. Some clones of *S. tuberosum* ssp. *andigenum* and of some 24-chromosome species showed slight or no discoloration of the raw tubers after peeling.

3549 Rothacker, D. & Effmert, B.
Untersuchungen am Sortiment wilder und kultivierter Kartoffelspecies des Instituts für Pflanzenzüchtung Gross-Lüsewitz (G–LKS). II. Über den Ascorbinsäuregehalt verschiedener Kartoffelspecies und Herkünfte. [**Investigations on the collection of wild and cultivated potato species of the Institute for Plant Breeding, Gross-Lüsewitz (G–LKS). II. The ascorbic acid content of different potato species and provenance types**].
Züchter 1960 : **30** : 292–98.
Amongst the many forms investigated, considerable variation in ascorbic acid content was found and some forms had an ascorbic-acid content 10% higher than that of standard varieties of *Solanum tuberosum*. Clones of *S. tuberosum* ssp. *andigenum* and some 24-chromosome species had a high ascorbic-acid content in April after several months' storage and these are considered to be useful breeding material.

3550 Chevassus, A. & Maire, G.
Les difficultés de conservation du plant de pommes de terre en Algérie. (**The difficulties in the storage of the potato crop in Algeria**).
Élevage et Cultures, Alger 1959 : No. 125 : unpaginated.
Information is provided on the suitability of a number of commercial varieties for cultivation and storage under various conditions.

3551 Linder, K., Jaschik, S. & Korpáczy, I.
Aminosäurezusammensetzung und biologischer Wert der Kartoffeleiweiss-Fraktionen. (**The aminoacid composition and biological value of the potato protein fractions**).
Qual. Plant. Mater. veg. 1960 : **7** : 289–94.
Tuberin was found to be the most valuable fraction and it is suggested that breeders should select for high tuberin content.

3552 Dionne, L. A. & Lawrence, C. H.
Early scab resistant derivatives of *Solanum chacoense* x *Solanum phureja*.
Amer. Potato J. 1961 : **38** : 6–8.
Diploid selections resistant to *Streptomyces scabies* were obtained by back crossing the F_2 of (*S. chacoense* x *S. phureja*) with *S. phureja*. The selections were high in solanin content (0·40–2·0 mg. per g.) but otherwise resembled early-maturing forms of *S. phureja*. Tetraploid clones of this material were produced by colchicine treatment, as a preliminary step to transferring scab resistance to *S. tuberosum*.

3553 Mélard, V.
L'amélioration de la résistance au *Phytophthora* de la pomme de terre en Belgique. (**The improvement of resistance to *Phytophthora* in the potato in Belgium**).
Europ. Potato J. 1961 : **4** : 40–51.
Investigations on the reaction of the foliage and tubers of 206 varieties of *Ph. infestans* at Libramont Research Station, Belgium, showed that some correlation exists between foliage resistance and tuber resistance. Races of the pathogen prevalent at Libramont and the dates of their original appearance are listed. In the breeding programme, increasing use is being made of various sources of field resistance, including several commercial varieties and a group of *Solanum andigenum* clones obtained from Neversdorf, West Germany.

3554 Lapwood, D. H. & McKee, R. K.
Reaction of tubers of R-gene potato clones to inoculation with specialized races of *Phytophthora infestans*.
Europ. Potato J. 1961 : **4** : 3–13.
Studies are reported on the tuber reaction of King Edward and 45 *R*-carrying potato clones to *Ph. infestans* races capable of inducing a hypersensitive reaction on the leaves and to other races able to infect and spread in the

leaves. The results showed that "although specific reaction of the tubers was determined by particular *R*-genes, the response was affected both by minor factors modifying the hypersensitivity, and by independent non-specific 'resistance' factors (field resistance)".
The hypersensitivity conferred by R_1 was shown to be more effective in inhibiting tuber invasion by certain races of the pathogen than the hypersensitivity conferred by R_2, R_3 or R_4. Tubers of most clones were highly susceptible to races able to spread in the leaves of these clones. The tubers of Orion and Reaal, however, were able to resist infection by races of this type.

3555 Golovin, P. N., Čerepanova, N. P. & Pšedeckaja, L. I.
(Comparative study of strains of *Phytophthora infestans* de Bary).
Bot. Ž. (Bot. J.), Moskva 1960 : **45** : 1600–18. [Russian].
On the basis of variation statistics applied to material collected in different parts of the Soviet Union, the strains were classified into five groups differing in dimensions of the zoosporangia. The characteristic features of the groups were maintained when they were reisolated from cultures on the susceptible potato Berlichingen and on the resistant species *Solanum dulcamara*. Thirteen races are described. No difference was detected in the behaviour of the different strains on domestic potato varieties but clear differences were noted in pathogenicity on wild species of *Solanum* and on certain hybrids. Some races proved capable of infecting *S. demissum, S. nigrum* and hybrid 9 from *S. demissum,* all of which were resistant to other strains. Some races from the south of the Soviet Union were capable of infecting *Datura stramonium* and *Nicotiana tabacum*. The races with large zoosporangia were generally more virulent than those with small sporangia.

3556 Gallegly, M. E. *et al.*
Report of the Late Blight Investigations Committee.
Amer. Potato J. 1960 : **37** : 399–400.
Studies on the nomenclature of races of *Phytophthora infestans* and on genes for resistance to the pathogen are reported. Evidence currently available indicates the existence of three additional genes, R_5, R_6 and R_7. A number of unidentified genes for resistance appear to be present in certain seedlings of Schick's Rxyz and in Gallegly's selections derived from *Solanum demissum.*

3557 Conroy, R. J.
Races of *Phytophthora infestans* (Mont.) de Bary on potato.
J. Aust. Inst. agric. Sci. 1960 : **26** : 357–58.
The presence of race 4 at Warriewood, NSW, in 1959 could not be explained on the basis of culture of R_4 genotypes in the locality. It would appear that mutation of race 0 had occurred.

Proceedings of the Canadian Phytopathological Society, Twenty-sixth Session, June 22–23, 1960, Ontario Agricultural College, Guelph, Ontario, 1960 : No. 27 : Pp. 34.

3558 *Hodgson, W. A. Field resistance to potato late blight. (p. 13).*
Field resistance to late blight was highest in the upper leaves of a vigorously growing plant, less high in leaves from the middle part of the plant and least in the lower leaves. Resistance was also dependent on inoculum concentration.

3559 Sadovnikova, V. I., Jakovleva, V. I., Rakovič, M. I. & Efremenko, T. S.
(Choosing the pairs of components in breeding wart-resistant potato varieties).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 113–17. [Russian].
The highest proportion of resistant hybrids was obtained from the resistant varieties Virulane Gladston, Zven'evoj [Detachment], Imandra, Kameraz 1, Katjuša, Namešaevskij, Pepo, Priekuļi Early, Trudovoj [Labour] and Šatrija. A table gives the percentages of resistant hybrids for 62 different pairs of components, the highest being 97% in Berlichingen x Trudovoj.

3560 Thiede, H. & Wierling, F.
Zur Methodik der Krebsresistenzprüfung im Laboratorium. **(Laboratory methods of testing for wart resistance).**
NachrBl. dtsch. PflSchDienst, Stuttgart 1960 : **12** : 171–72.
An improvement in the Spieckermann potato-testing procedure is described which gives more consistent and rapid results. It involves (*a*) keeping the infected compost moist for about 15 days before use in testing, and (*b*) using absorbent paper instead of sand to cover and moisten the test material.

3561 McLean, J. G., Le Tourneau, D. J. & Guthrie, J. W.
Relation of histochemical tests for phenols to *Verticillium* wilt resistance of potatoes.
Phytopathology 1961 : **51** : 84–89.

The relative concentrations of o-dihydroxy phenols, chiefly chlorogenic acid, were determined in 12 different tissues in the underground portion of six varieties from the time of germination to maturity, by means of a 10% $FeCl_3$ solution. Use of methyl red also disclosed the presence of chlorogenic acid, as indicated by a lower pH value. Concentrations of phenolic compounds were extremely high in the vascular systems and root and sprout tips of all young plants. The concentrations in the vascular tissues of the different parts were greater in the three varieties resistant to *Verticillium albo-atrum* than in the three susceptible ones. As the plants developed, the concentrations decreased more rapidly and to a lower level in the susceptible than in the resistant varieties. Development of wilt symptoms in the field coincided with, or followed, the decrease in phenols in the vascular tissues. The correlation between the $FeCl_3$ reaction of the tuber periderm and scab resistance was highly significant in a test of over 400 varieties and selections. In a test of 200 lines, a highly significant correlation was detected between $FeCl_3$ reaction of the cortex of freshly harvested tubers and field resistance to *Verticillium* wilt. The correlation between $FeCl_3$ reaction of the underground stem node and wilt resistance was also highly significant in a test of 100 entries. The cortical test was sufficiently accurate for the preliminary screening of varieties and selection for resistance. Chlorogenic acid in distilled water inhibited spore germination and mycelial growth of *V. albo-atrum*. Concentrations of o-dihydroxy phenols in young, actively growing plants, as well as in resistant individuals, were much greater than inhibitory concentrations *in vitro*.

3562 MacKinnon, J. P., Rankin, D. F. & Young, L. C.
Testing potato seedlings for resistance to the leaf roll virus.
Amer. Potato J. 1960 : **37** : 373–76.

In studies at Fredericton, NB, conducted during 1955–59, 132 potato seedlings were exposed to natural field infection and to aphid vectors carrying the virus. Several seedlings showed resistance to field infection, while a high degree of resistance to both forms of virus infection was noted in F4896 (Southesk x Katahdin).

3563 Bagnall, R. H. & MacKinnon, J. P.
Resistance to potato virus A in the Katahdin variety.
Europ. Potato J. 1960 : **3** : 331–36.

It is concluded that, if an inhibitory substance is present in this variety, it is not localized in the epidermis and does not depend directly on the chlorophyll for its existence.

3564 Hoyman, W. G., Manzer, F., Wright, N. S., Hooker, W. J. & Munro, J.
Report of the Potato Virus Investigations Committee.
Amer. Potato J. 1960 : **37** : 400–01.

Plants infected with virus Y were shown at East Lansing, Mich., to be more susceptible to early blight than healthy plants. Two promising seedlings with resistance to the spindle-tuber virus have been bred in Maine. In New Brunswick, four seedlings showing hypersensitivity to several strains of virus Y are undergoing quality tests.

3565 Ross, H.
Die Praxis der Züchtung auf Infektionsresistenz und extremer Resistenz (Immunität) gegen das Y-Virus der Kartoffel. [**The practice of breeding for resistance to infection and extreme resistance (immunity) to potato virus Y**].
Europ. Potato J. 1960 : **3** : 296–306.

The sources and modes of inheritance of different types of resistance are mentioned and methods of selecting for resistance are described with reference to the work carried out at the Max Planck Institute for Breeding Research, Köln-Vogelsang, Germany.

3566 Oshima, N.
(Studies on potato virus X).
Hokkaido Nogyo Shikenjo Hokoku/Rep. Hokkaido agric. Exp. Sta. 1959 : No. 53 : Pp. 159. [Japanese].

An extensive study of the behaviour of virus X in potato varieties grown in Hokkaido is reported. Twenty strains of the virus, grouped into ring-spot and mottle strains, are differentiated. The reactions of Japanese and introduced varieties to these strains are described in detail.

3567 Calvert, E. L.
Potato virus A in the variety Ulster Torch.
Plant Path. 1960 : **9** : 144–46.

Virus A cultures from Ulster Torch, Irish

Chieftain and Golden Wonder were transmitted by core grafting to a number of tolerant potato varieties. Data on varietal response demonstrated the existence of four distinct strains of virus A. Two of the strains were virulent and were found in Ulster Torch cultures only; it is suggested that the two strains may have arisen in this variety after an initial infection with a mild strain.

3568 HARMON, S. A.
Genetic studies and compatibilities in the sweet potato (*Ipomoea batatas*).
Diss. Abstr. 1960 : **21** : LC Card Mic. 60–2976 : 411–12. (Abst.).

In investigations at Louisiana State University, considerable differences between clones were found in degree of cross and self compatibility. In general, a clone giving a capsule set as ♀ parent was equally cross compatible as ♂ parent. The period 07·30–08·30 hr. was the most favourable time for pollination. The results from crosses involving the internal-cork resistant varieties Whitestar, HM–15, HM–36 and Creole and susceptible varieties Porto Rico, Code 21 and Code 130 showed resistance to this disease to be dominant, and HM–15 and HM–36 to be outstanding in their ability to transmit this property. The progenies were tested for carotene content. The results indicated that both parents should have a carotene content as high as Porto Rico, in order to obtain a high proportion of progenies equalling or surpassing this variety. Inheritance of carotene content appeared to be quantitative, with higher content recessive. Leaf type, stem colour and vine length also seemed to be quantitatively inherited. The deeply cleft type of leaf was dominant. The data suggested that stem colour had a very complex mode of inheritance, several non-allelic genes being suspected of influencing the degree and pattern of purple coloration. Green stem showed dominance over purple. Shortness of the vines was dominant, HM–15 and Code 21 being the parents most capable of transmitting this character.

3569 SLOMNITZKI, I. [SLOMNITSKI, Y.], LŒVENSTEIN [LOVENSTIYN], G. & COHEN, I. [KOHEN, Y.].
(Gokoko, a new sweet-potato variety).
Sadeh(Field)/Hassadeh 1960 : **40** : 621–22. [Hebrew].

Gokoko, a virus-resistant Japanese variety introduced in 1954, performed well in tests at the Agricultural Research Station, Beit Dagan, Israel.

FIBRES

3570 KANAŠ, S.
(Cotton production in French Africa).
Hlopkovodstvo (Cotton Growing) 1959 : No. 11 : 62–64. [Russian].

Breeding work with cotton in present and former French territory in Africa is surveyed.

3571 ALEKSANDROV, A. S.
(Measures for the continued improvement of cotton breeding and seed production in the USSR).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 11 : 34–43. [Russian].

A number of promising varieties are listed. Some are early fine-fibred varieties with high yield, resistance to *Fusarium* and a lint length of 34–36 mm. Some selections of Kazah and Uzbek forms are superior to the initial forms in respect of lint length, fibre quality, size of boll and ginning percentage.

3572 ALEKSANDROV, A. S.
(The All-Union Conference on the Breeding and Seed Production of Cotton).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 9 : 157–58. [Russian].

This conference at Taškent in June 1959 recommended the introduction into cultivation of S1581, S1622, S4727, 8763I, 9041I and some other recent varieties. These have high yields, resistance to wilt, short growth periods and high-quality fibre.

3573 BOZA BARDUCCI, T.
Algunos aspectos del mejoramiento del algodón Tangüis. **(Some aspects of the improvement of Tangüis cotton).**
Circ. Estac. exp. agríc. Cañete 1960 : No. 17–D : Pp. 8. (Mimeographed).

A detailed account is given of the history and significance of Tangüis cotton. Improved varieties developed by various research stations and organizations in Peru are described briefly. A number of current problems in cotton breeding are discussed.

3574 PANIKKAR, M. R.
Our agricultural pioneers—IV.
Indian Fmg. 1961 : **10** : No. 10 : 31–32.

A short biography is followed by an account of V. Ramanatha Ayyar's contribution to cotton breeding in Madras.

3575 Lawes, D. A.
A method of labelling plants.
Emp. Cott. Gr. Rev. 1961 : **38** : p. 50.
At the Ministry of Agriculture Research Station, Samaru, Northern Nigeria, use of pieces of pliable card stapled into position round the stem has proved to be more satisfactory in selection and other studies than tying on luggage labels.

3576 Manning, H. L.
BP 52 cotton: breeding for yield improvement.
Text. Wkly 1959 : **59** : 567–68, 571, 573.
By means of the selection index method of breeding, a number of improved, high-yielding, multiline strains of BP52 have been developed at Namulonge, Uganda. The new strains are designated according to the year of release, the most recent being NC/58. Various aspects of the breeding system are discussed, particular reference being paid to methods of assessing its effectiveness.

3577 Lewis, C. F.
The inheritance of mottled leaf in cotton.
J. Hered. 1960 : **51** : 209–12.
A mottled-leaved mutant was found in an introduction of *Gossypium hirsutum* in the cotton collection maintained at the Texas Agricultural Experiment Station. It proved to be recessive to the normal green condition and dependent on a single gene (*mt*).

3578 Phillips, L. L.
The cytogenetics of speciation in Asiatic cotton.
Genetics 1961 : **46** : 77–83.
The degree and nature of speciation in *Gossypium arboreum* and *G. herbaceum* were determined by assessing the genetic behaviour in interspecific hybrids of the linked loci *L*, *Cu* and Lc_1 and two other loci, with particular reference to gene transmission, genetic recombination and tetraploid segregation. "A nonsignificant degree of selective elimination of donor parent genotype in backcross progenies was noted for each of the linked loci. There was a significant amount of elimination found for each of the two other loci. Crossing over within the *L–Cu–*Lc_1 linkage and segregation for leaf shape were both significantly altered from expected in the interspecific hybrid. The results are explained on the basis of cryptic structural differentiation of the chromosomes of the two species".

3579 Vysockij, K.
(Utilizing heterosis in cotton production).
Hlopkovodstvo (Cotton Growing) 1959 : No. 12 : 43–45. [Russian].
F_1 seed from an Upland x Egyptian cross was obtained, without resorting to emasculation, at the Central Breeding Station of the Cotton Institute. The ♀ parent was 315, an Upland variety recently developed at the above Institute: the ♂ parent was 5974I, which differs from 315 in leaf and stem colour. Pollinations between 9 hr. and 13 hr. promoted fertilization, the percentage of hybrid seed obtained being 60–70%. The hybrids were distinguishable from other plants by intermediate colour from the early growth stages onwards and this facilitated the removal of unwanted types. The F_1 was intermediate in boll size and growth period and developed more fruits per plant than either parent. It outstripped its parental forms in raw-cotton yield, the difference being the greater the earlier the sowing date. The hybrid plants were distinguished by thinness and firmness of fibre, which was 41–42 mm. long as against 34–35 mm. in 315 and 38–39 mm. in 5974I. Enough F_1 seed has been produced to sow 5 ha. on a farm in Uzbekistan in 1960 and an additional 10 ha. have been reserved on the same farm for the production of F_1 seed.

3580 Endrizzi, J. E. & Phillips, L. L.
A hybrid between *Gossypium arboreum* L. and *G. raimondii* Ulb.
Canad. J. Genet. Cyt. 1960 : **2** : 311–19.
F_1 *G. arboreum* 'Garo Hill' x *G. raimondii* showed $0{\cdot}037_{IV} + 0{\cdot}089_{III} + 5{\cdot}90_{II} + 13{\cdot}79_{I}$ per cell at metaphase I. On the basis of cytological data reported by other workers for hybrids of *G. arboreum* with *G. armourianum*, *G. thurberi* and *G. raimondii* and the authors' finding that pairing in *G. arboreum* x *G. raimondii* was almost without exception allosyndetic, it is concluded that, of the three D-genome species, *G. raimondii* (D_5) has the chromosome complement with most affinity with the A_2 genome of *G. arboreum*. The investigations also included comparison of the two parents and their hybrid with respect to several morphological characters. In leaf shape the hybrid was similar to Garo Hill.

3581 Ter-Avanesyan [Ter-Avanesjan], D. V.
A new method of hybridization in cotton.
Indian J. Genet. 1960 : **20** : 150–59.
In experiments at Taškent, Uzbekistan, a

number of interspecific and intergeneric hybrids were obtained when *Gossypium hirsutum* varieties were used as female parents in crosses with *G. arboreum, G. herbaceum* and species from other malvaceous genera including *Hibiscus coccineus, H. rosa-sinensis, Malva neglecta, Althaea rosea* and *Abelmoschus* (*Hibiscus*) *esculentus*. Two pollination techniques are described. In the first the flowers are emasculated on the evening before opening and isolated; the following morning they are pollinated with a limited amount of maternal pollen (about 20 grains) followed three hours later by unlimited amounts of paternal pollen. In the second method the flowers are emasculated and immediately pollinated with unlimited amounts of paternal pollen; early the following morning unlimited paternal pollen is again applied and this is followed at noon (about 20 hr. after emasculation) by a mixture of paternal and maternal pollen. Agronomically valuable strains are being selected from the hybrids obtained.

3582 Ljackij, M.
(Some problems of cotton seed production).
Hlopkovodstvo (Cotton Growing) 1959 : No. 11 : 12–13. [Russian].

It is held that some work at present done by seed producers should be performed by plant breeders. This includes intravarietal hybridization for improvement of varietal stocks and the breeding of new varieties from divergent forms occurring in varietal material on seed farms. Mičurinist methods of directed training are not advanced enough to solve practical problems on seed farms such as improving the earliness of the wilt-resistant variety S460, or increasing the resistance of the fine-fibred 2IZ and 35–1 to *Fusarium* or of 108F to lodging.

3583 Innes, N. L.
Natural crossing in cotton in the Sudan.
Emp. Cott. Gr. Rev. 1961 : **38** : 15–21.

As in investigations by other workers, natural crossing at the Gezira Research Station was low and at Shambat fairly high. At both places, the amount of natural crossing was however higher than previously detected, the maximum percentages being 2·66 and 34·86 respectively. A difference in the effective bee population appears to be the main cause of the disparity in degree of natural crossing at the two stations.

3584 Annappan, R. S.
Floral abnormality in cotton.
Madras agric. J. 1960 : **47** : 519–20.

PK1609, a strain selected from 134 Co.2 x Meade, showed great variation in number of bracts per flower. Analysis of 50 plants showed that 4% had a single bract and no ovary while 26% had two bracts and in most cases an ovary; the ovary was normal in 74% of these but was rudimentary or absent in the remainder. The remaining 70% had the normal three bracts with normal ovaries.

3585 Frampton, V. L., Pons, W. A. (Jun.) & Kerr, T.
A comparison of chemical properties of seeds of *Gossypium* species.
Econ. Bot. 1960 : **14** : 197–99.

The possibility of exploiting germ plasm from wild cottons in the improvement of commercial varieties, particularly in seed quality, prompted the analysis of seeds of several species. Pronounced interspecific differences were found in gossypol content, which ranged from 0·13% in *G. stocksii* to 6·64% in *G. klotzschianum* var. *davidsonii*. Oil percentages fell within the range normally encountered within *G. hirsutum*. The species were similar in N and lysine contents, with the exception that *G. triphyllum* was noticeably higher in N content.

3586 Nakhorthaph, A.
(Observations on cotton growing in Siam).
Kasikor (Farmer)/Kasikorn, Bangkok 1955 : **28** : 115–20. [Siamese].

Upland (*Gossypium hirsutum*) strains are less resistant to diseases and pests than the local *G. arboreum* cottons; it is considered therefore that Siamese breeders should concentrate on improving the latter.

3587 Innes, N. L. & Last, F. T.
Cotton disease symptoms caused by different concentrations of *Xanthomonas malvacearum*.
Emp. Cott. Gr. Rev. 1961 : **38** : 27–29.

American Upland varieties and S and L types of Egyptian cotton carrying different combinations of *B* genes were sprayed with different concentrations of the pathogen under field conditions during 1958 and 1959 at Shambat, Sudan. Decrease in concentration caused decrease in disease grading, based on size and severity of individual lesions and not on lesion number. This effect differed, however, according

to variety. On resistant varieties with combinations involving B_{6m}, the disease grade decreased by one, whereas on susceptible varieties without any *B* genes disease declined by three grades.

3588 Vezelvlas, 1961. **(Fibre flax, 1961).** Landbouwvoorlichting 1961 : **18** : Bijl. 84; Ber. Rassenkeuze No. 301 : Pp. 3.

Data on yields of straw and seed and content of fibre are given for 13 varieties together with descriptive notes. Hijlkema, a white-flowered variety with good resistance to rust and *Pythium megalacanthum*, has been admitted to the Netherlands varietal list.

3589 Valatka, P. **(A seminar of plant breeders).** Lën i Konoplja (Flax & Hemp) 1959 : No. 12 : p. 27. [Russian].

Quality testing of flax, in particular new techniques suitable for determining technological value and fibre-extraction rate in breeding material from small samples were discussed at a recent conference at the Central Fibre Institute.

3590 Kiss, E. A lenmagtermelés elemzése és fajtaismerete. **(Seed-yield analysis and varietal recognition in flax).** Magyar tud. Akad. Agrártud. Oszt. Közl. 1960 : **17** : 377–80.

This report of work on a varietal collection in Hungary includes the following observations. All varieties studied were of the long-day type with respect to development period, but southern forms often gave larger yields of stems and seeds under short-day than under long-day conditions. Fibre flaxes had a greater heat requirement than oil types during vegetative growth, while the reverse was true during the reproductive phase; dual-purpose types were intermediate. Varieties resistant to *Colletotrichum* have been selected [cf. XXVIII, 4473]. Varietal differences in the parts played by stand density, capsule number and seed size in determining yield have been detected. Number of sterile flowers per plant was a varietal character.

3591 Vallega, J. & Antonelli, E. F. Variaciones en la población parásita de la roya del lino en la Argentina. **(Variations in the parasitic population of flax rust in Argentina).** Rev. Inst. agríc., B. Aires 1960 : **14** : 403–20.

The distribution of races of *Melampsora lini* during 1957–1958 was found to be similar to that obtaining in previous years. The major change was the appearance of race 267 (Arg.14), which attacked Bombay CI42. The most prevalent races in 1958 were 246 (Arg.4) and 278 (Arg.12). Tabulated data are provided on the reaction of 48 differential lines and 22 commercial varieties of flax to 14 races of *M. lini*. Varieties which showed resistance to all races were Flandes MAG, Calchaquí 53MAG, and two lines of Calchaquí MAG, DIV7031 and DIV9170.

3592 Lochhead, A. G. & Cook, F. D. **Microbial growth factors in relation to resistance of flax varieties to *Fusarium* wilt.** Canad. J. Bot. 1961 : **39** : 7–19.

The flax varieties Bison and Novelty, respectively resistant and susceptible to *F. oxysporum* f. *lini*, differed in degree of rhizosphere effect with regard to the growth-factor requirements and synthesizing ability of bacteria associated with their root surfaces; no evidence was found, however, of any causal relationship between rhizosphere effect and disease resistance. The possibility that differences in available vitamins may affect the pathogen by modifying its growth capacity or pathogenicity is discussed.

3593 Klimovskij, G. I. **(Some results of state varietal trials of hemp).** Lën i Konoplja (Flax & Hemp) 1959 : No. 10 : 31–32. [Russian].

Recent Soviet varieties and an introduced monecious variety from Bernburg, Germany, are briefly described. Gluhov 1 and Gluhov 6 have a high fibre content, Odnodomnaja Srednerusskaja [Central Russian Monecious] and Južnaja Odnodomnaja [Southern Monecious] have short growth periods, while Odnodomnaja Krasnodarskaja 1283 [Krasnodar Monecious 1283] has a 0·5–1·3 c. per ha. higher fibre yield and 0·4–1% higher fibre content than Ukrainian and Caucasian standard varieties. The German monecious variety is more productive of seed and fibre, and of long fibres, than Odnodomnaja Srednerusskaja.

3594 Danell, N. Ny samkönad hampsort presenteras. **(A new monecious hemp variety is introduced).** Lantmannen, Stockholm 1961 : **72** : p. 233, 235.

Fibrimon, a recent German variety bred by Sengbusch, has given 16–135% higher yields

than Mona in preliminary tests in Sweden. Fibre strength and spinning quality are satisfactory but seed production is low, being about 37% lower than that of Mona.

3595 Guržij, E. S. & Merežko, V. S.
(Hybridization of the southern hemp Čerkassk with a monecious form).
Lën i Konoplja (Flax & Hemp) 1959 : No. 12 : 25–27. [Russian].

The new monecious variety 20 was obtained by hybridization of the highly productive late variety Čerkassk ♀ with a monecious central Russian ♂ form characterized by earliness and high seed yield. The hybrid equals or exceeds the ♂ parent in seed yield and is more productive of fibre. It is appreciably earlier than Čerkassk.

3596 Canev, K.
(Bulgarian hemp fibre and its technological properties).
Lën i Konoplja (Flax & Hemp) 1959 : No. 10 : 47–48. [Russian].

Mention is made of the new variety G3 from the Marica Institute which is highly productive of stems and has a higher fibre-extraction rate than the varieties now cultivated in Bulgaria.

3597 Wichert-Kobus, I.
Badania nad otrzymaniem sztucznych autotetraploidów konopi. **(Studies on the production of artificial autotetraploids of hemp).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 275–95.

Colchicine-induced tetraploids developed at Puławy, Poland, had a vegetative period 10–15 days longer than that of diploids, showed simultaneous flowering of male and female plants and displayed reduced pollen viability. Compared with the diploid controls, the tetraploids and their first-generation progeny were taller and had larger leaves, seeds and stomata and twice as thick a phloem layer in the stalk.

3598 Köhler, D.
Ein Beitrag zur Physiologie und Genetik der Geschlechtsausprägung von *Cannabis sativa.* **(A contribution to the physiology and genetics of the expression of sex of *C. sativa*).**
Planta 1961 : **56** : 150–73.

The effects of photoperiod on flowering and vegetative development are described. Two types of short day plants have been distinguished: one type flowers after the photoperiod has fallen below critical length and the other will flower in continuous light. In early monecious plants, the conditions before the induction of flowering have considerable effect on sex expression; high light intensity and a long day favour the development of maleness. The origin of the different sexual forms of hemp from the males and females of diecious plants and the mode of action of external and internal factors on sex expression are discussed.

3599 **Annual Report of the Jute Agricultural Research Institute (1958–59).**
Indian cent. Jute Comm. 1960 : Pp. 126.

Jute. Selection within indigenous collections of *Corchorus olitorius* and *C. capsularis* continued. Progeny-row trials of both species were carried out. The results of varietal trials at the institute and on cultivators' plots are reported. Further attempts were made to hybridize the two species and apparently viable seeds were carried forward. A total of 560 promising selections, derived from *C. capsularis* intervarietal crosses, were also carried forward. Green and red *C. olitorius* lines from Russia were crossed with JRO–632. Seven full-green genotypes have been isolated and included in the stock of genetic strains. Seven bivalents were observed in the pollen mother cells of *C. depressus*; 28 chromosomes were found in the somatic cells of *C. siliquosus.* Polyploid jute plants were produced by treating dry seeds with colchicine. Data on the structure and quality of the fibres of three *C. capsularis* and two *C. olitorius* varieties are reported. Differences were noted in the response of jute varieties to various day-length treatments. Selection for resistance to *Apion corchori* and several fungous diseases continued [cf. XXVIII, 3220 and XXIX, 4154].

Urena. Twelve F_1 *U. sinuata* x *U. lobata* plants were carried forward for further studies. Of 45 back crosses attempted between the F_1 plants and the parental species, 20 were successful.

Hibiscus. A large number of primary and secondary selections of *H. cannabinus* and *H. sabdariffa* were made. Study of direct hybrids and back crosses of *H. radiatus* x *H. cannabinus* and of the inheritance of anthocyanin pigmentation in *H. sabdariffa* and *H. cannabinus* continued. Ten successful crosses were made between bristly and nonbristly *H. sabdariffa* varieties. The inheritance of this character, and of earliness in *H. cannabinus*, is being investigated. Polyploids of *H. cannabinus* were obtained by colchicine treatment.

3600 **Olitorius and Capsularis successfully hybridized.**
Jute Bull. 1960 : **23** : p. 256.

A popularly written report is given on a plant resulting from hybridization between *Corchorus capsularis* and *C. olitorius* at the Indian Agricultural Research Institute, New Delhi. Hybridization had been facilitated by interspecific grafting and exposure of *C. capsularis* pollen to X rays before using it to pollinate *C. olitorius*. The plant is described as possessing strong white fibre, wide adaptability to soil and climatic conditions and a high degree of resistance to pests and diseases.

3601 Datta, R. M., Dana, S. K. & Banerjee, S. N.
Investigations on the interspecific hybridization between the autotetraploids of the cultivated jute species ("*Corchorus olitorius* Linn.", "*C. capsularis* Linn.") and on the failure of viable seed formation in them.
Genet. iber. 1960 : **12** : 139–72.

Attempts to hybridize 4*n* *C. olitorius* 'CG' and 4*n* *C. capsularis* 'D154' in 1957 and 1958 are reported. When *C. olitorius* was used as the female parent, a number of pods set, the percentage being 16 in 1957 and 34 in 1958. However none of these pods produced normal, viable seed. When *C. capsularis* was used as the female parent, pods failed to develop normally. Detailed information is provided on the cytological and morphological observations made during the investigation. The main barriers to successful hybridization appeared to be similar to those preventing hybridization at the diploid level [cf. 689 and 2290].

3602 Roy, R. P. & Sinha, R. P.
Meiotic studies in some malvaceous species.
Curr. Sci. 1961 : **30** : 26–27.

The following chromosome numbers are reported: *Sida veronicaefolia*, $2n = 28$; *S. acuta*, $2n = 18$; and *Abutilon indicum*, $2n = 36$. The chromosome number of *S. veronicaefolia* is derived from a basic number of 7, while in the other two species the basic number is 6. Taxonomic implications of these results are discussed briefly.

3603 Pate, J. B., Joyner, J. F. & Seale, C. C.
Vigor in an interspecific hybrid of *Sansevieria*.
Econ. Bot. 1960 : **14** : 175–79.

S. trifasciata, *S. deserti* and six F_1 hybrids produced by crossing these species were tested on Everglades peat and Immokalee fine sand in southern Florida. The F_1s showed considerable hybrid vigour [cf. XXX, 2938] and were superior to either parent in total green yield, percentage of fibre leaves, fibre-leaf yield and fibre yield, leaves 20 in. or more in length being classed as fibre leaves. Yields were much higher on the peat than on the sandy soil. Some of the hybrids equalled or surpassed the parents in overall fibre quality, the fibre produced in the test on the sandy soil being better in quality than that from the experiment on peat. The vigour of the F_1s is attributed to a combination of favourable growth factors from the two ecologically diverse parent species.

3604 Krzyształowski, Z.
Technologiczne możliwości wykorzystania wyodrębnionych biotypów *Yucca filamentosa* L. na tle anatomicznego porównania liści. (**Technological possibilities of the exploitation of selected biotypes of *Y. filamentosa* L. on the basis of anatomical comparisons of the leaves**).
Acta agrobot., Warszawa 1960 : **9** : No. 2 : 159–70.

In selected material studied at Swadzim, near Poznań, the leaf fibres were arranged partly in crescent-shaped layers adjoining the vascular bundles and partly in small peripheral bundles consisting of fibres alone. Selection 5 had the largest total number of bundles, with a high percentage of small bundles (62·31%) and a low percentage of large (37·69%). The possibility of using this biotype in the production of relatively fine fibres and as a parent in breeding further fine-fibred types is discussed.

3605 **Hybrid sisal in Tanganyika.**
Sci.-Afr. 1960 : No. 22 : p. 4.

Hybrid 11648, derived from (*Agave amaniensis* x *A. angustifolia*) x *A. amaniensis*, is characterized by high leaf number, good leaf length, freedom from marginal spines and high yielding capacity. The new hybrid, which was bred at the Sisal Research Station, Tanganyika, is now undergoing further tests.

SUGAR AND STARCH PLANTS

3606 **Proceedings of the Joint Convention of the Sugar Technologists' Association of India, Kanpur, and the Deccan Sugar Technologists' Association, India, held at Law College, Poona 1959** : Pt. 2 : Pp. 19 + 102 + 12 + xii + 22.

In this report, reference is made to a number

of sugar-cane varietal trials conducted in various parts of the Deccan.

3607 Bregger, T., Dunckelman, P. H., Le Grand, F., Todd, E. H. & Questel, D. D.
A review of sugarcane research in Florida—1939–1959.
Philipp. Sug. Inst. Quart. 1960 : **6** : 113–20.
The varietal improvement programme in Florida is discussed briefly.

3608 **Annual Report of the Experiment Station of the South African Sugar Association for 1958–59** : Pp. 33.
A report is given on (1) trials of seedlings constituting the third N : Co. series and of the N50 and N51 series, (2) the earlier stages of selection, (3) trials of introduced varieties and (4) the raising of new seedlings from further crosses.
Exposure to favourable day lengths for more than 2 months was necessary for the flowering of marcotted stalks. The fact that floral initiation was induced in varieties such as Uba, POJ2727, Co.213 and Diamond 10, which rarely flower under conditions in Natal, suggested that this technique should prove useful in breeding. In the routine induction of pollen fertility by subjecting detached shoots to artificially increased temperatures, there is frequently high mortality of the inflorescence primordia. According to preliminary experiments, the mortality may be reduced by (1) using water of greater purity in making up the preserving solution and (2) moving the shoots outside the glasshouse during the day. Fertile pollen is produced provided the shoots are kept in a heated building at night.
Preliminary results indicated that Brix determination offers a fairly reliable basis for selection of single-stool seedlings.
The reactions of varieties and seedlings to ratoon stunting, gumming, red rot and mosaic were determined.

Proceedings of the Thirty-Fourth Annual Congress of the South African Sugar Technologists' Association, held in Durban 28th March–1st April, 1960 : Pp. 196.

3609 *Steward, E. Natal sugarcane varieties, some observations and statistics.* (*pp. 134–40*).
Information is given on 16 varieties released by the South African Sugar Experiment Station, Mount Edgecombe, since 1930.

3610 *Halse, C. G. & Thompson, G. D. Yield data for experiments, harvested at Illovo, 1958–1959.* (*pp. 141–50*).
Trials of Natal varieties were conducted at a number of sites and recommendations are made for various types of soil.

3611 Pimentel Gomes, F. & Abreu, C. P. de Novas variedades de cana-de-açúcar. (**New sugar-cane varieties**).
An. Esc. Agric. Queiroz 1959 : **16** : 199–210.
Yield trials involving 16 varieties were conducted at six centres in the State of São Paulo, Brazil. Highest yields were obtained from CB40–69, CB41–76, CB40–13, CB40–19 and Co.419.

3612 **Comparative performance of six varieties of sugarcane grown in Pasumil Mill district.**
Philipp. Sug. Inst. Quart. 1960 : **6** : 102–06.
Two Coimbatore lines, Co. 453 and 527, significantly outyielded POJ3016, Alunan and F109. A third line, Co.617, gave significantly higher yields than Alunan and F109.

3613 **60th Annual Report of the Bureau of Sugar Experiment Stations, Queensland 1960** : Pp. 102.
Sugar cane. Selection of seedlings continued at the various stations and a number of further crosses were made. Investigations into methods of selection and experimentation also continued. It has been shown that three-row 0·01-acre plots are satisfactory for replicated variety trials, despite border effects. There are indications that the lattice square design is more efficient for varietal trials than the randomized block design.
Five new varieties were approved in 1960. Q69 and Q72 are drought-resistant types suitable for the Isis district. Q71 has an exceptionally high early sugar content and was released for the Maryborough and Moreton districts. Q73 is approved for growing in the Mackay and Proserpine mill areas while Damon is approved for the Macknade and Victoria mill areas.
Investigations into methods of measuring varietal resistance to lodging have continued. "It has been found that lodging resistance is correlated with the force required to move stalks sideways through a fairly small angle. The term physical lodging resistance is proposed for the varietal character estimated by the measurements."

Cowpea. Crosses that have performed well are Havana x Black Eye 5, Havana x Malabar and CPI12153 x Black Eye 5.

HUMBERT, R. (Editor).
Proceedings of the 10th Congress of the International Society of Sugar Cane Technologists, Hawaii 1959 (1960) : Pp. 1174.

3614 *Sprague, G. F. Inbreeding compared with recurrent selection in corn improvement.* (*pp. 653–61*).
Three functions of inbreeding are considered: (1) the provision of a diversity of genotypes, (2) the propagation of a particular genotype or gene frequency and (3) repeatability in crosses. It is concluded that recurrent selection schemes provide for these three functions with a much lower level of inbreeding than is required by standard inbreeding and hybridization procedures.

3615 *Burton, G. W. Principles of breeding vegetatively propagated plants.* (*pp. 661–70*).
The plant breeder is called upon to define his objectives and to evaluate his materials and methods critically. Reference is made to studies by the author and others on breeding in grasses, pearl millet and sugar cane and the need is stressed for a germ-plasm bank for sugarcane similar to that available to small-grain breeders.

3616 *Stevenson, G. C. Inbreeding with sugar cane in Barbados.* (*pp. 670–82*).
Cytological studies on selfed plants of (1) noble canes and (2) interspecific-hybrid commercial varieties and breeding canes showed that, while the chromosome number remained constant in the former group, chromosome losses occurred in the latter. An exception was found in the inbreds from an original sib cross between B37161 and B37193; these inbreds showed no loss of chromosomes and were among the most vigorous of the plants obtained. While self sterility was sometimes met with, moderate or good fertility was common. While lack of vigour was noted in selfed *Saccharum officinarum* varieties, this was not always true of the hybrids; vigour was particularly good in hybrids having *S. spontaneum* in their ancestry. No regular relation was found between plant vigour and arrowing, many of the weakest inbreds arrowing early and heavily while some of the most vigorous arrowed late and lightly. Of 135 clones representing S_3 and S_4 generations, only 9 failed to arrow and these were not the weakest in the collection. Male sterility was surprisingly low and was rare after the second generation of selfing; this is attributed to selection for meiotic regularity in the early generations.
Populations of seedlings of which one or both parents were inbreds were subjected to the same selection procedures as populations from general programme crosses. While selection percentages varied from cross to cross, the overall percentage was higher for the inbred crosses and top crosses than for the general programme crosses.

3617 *Daniels, J. The inbreeding and close breeding of sugarcane.* (*pp. 682–89*).
Details are given of results obtained in the Fiji Islands from (1) a selfing and back-crossing programme as outlined by Brandes and Sartoris, (2) a close-breeding programme where at least two of the grandparents or four of the great-grandparents are identical, and (3) inbreeding programmes for the development of commercial varieties and parental lines. Methods (1) and (2) give results similar to outcrossing but the type of progeny is more predictable; if a good commercial variety is available it would be possible, using either of these methods, to produce substantially the same type but with considerable improvement in such defects as poor early sucrose content and susceptibility to downy mildew.
Since inbred types with high sucrose are usually poor yielders, it is considered that selection within a closed population is preferable to inbreeding as a means of developing commercial varieties.

3618 *Buzacott, J. H. Methods of cane breeding used by the Queensland bureau of sugar experiment Stations.* (*pp. 690–94*).
The following are described: cross pollination using arrows maintained in solution, the use of lanterns, induction of tasselling and synchronization of flowering, interspecific hybridization and seed storage. In the hybridization field, attention is being concentrated on the further nobilization of hybrids involving *Saccharum spontaneum* 'Burma'; hybrid EPC38–304 (POJ2725 x *S. spontaneum* 'Burma') is regarded as particularly promising. *S. robustum* clones from New Guinea which are resistant to flooding and waterlogging are also being used in breeding; clones 51NG63 and 53NG140 are vigorous male-fertile clones and the latter stools more profusely than most *S. robustum* clones. An addendum gives a detailed account of the methods used to delay flowering, including the use of artificial light, maleic hydrazide and foliage lopping.

3619 *Mangelsdorf, A. J. Sugar-cane breeding methods.* (*pp. 694–701*).
The pedigree of POJ2878 is examined and an account of its breeding history is used as the basis of a comparison between the Java breeding programme which produced it and the present-day breeding programme in Hawaii.

3620 *Urata, R. & Warner, J. N. Criteria for sugar-cane selection in Hawaii.* (*pp. 702–08*).
A six-stage selection procedure which is practised on bunch-planted seedlings at the Kailua Field Laboratory is described.

3621 *Skinner, J. C. Bunch planting experiments.* (*pp. 708–14*).
Data are provided from three experiments designed to evaluate the Hawaiian bunch-planting technique under Queensland conditions; the first of these was reported earlier [cf. XXVIII, 4489]. The two subsequent experiments were severely damaged by a cyclone in 1956 but it was evident that bunch selection was more effective in some crosses than in others. Different selection rates were tried and it was found that, while moderate selection was beneficial, severe selection was less successful; the optimum selection rate under Queensland conditions appeared to be much higher than that used in Hawaii.

3622 *Hebert, L. P. & Newton, B. S. Bunch planting of sugarcane seedlings at the U.S. Sugarcane Field Station, Houma, Louisiana.* (*pp. 715–20*).
Preliminary tests indicated that units of up to 5 plants did not decrease the efficiency of initial selection; a lower efficiency was found however in 10-plant units. A small negative correlation was found between number of tillers at planting and number of stalks at maturity.

3623 *Wagenaar, G. A. W. Selection schedule used at the Java Sugar Experiment Station—Pasuruan.* (*pp. 721–32*).
Details are given of a ten-year selection schedule which has been evolved at Pasuruan during seventy-five years of cane breeding. The schedule involves rigid selection during the early years for resistance to mosaic, *Fusarium moniliforme* and leaf scald (*Xanthomonas albilineans*). The visual and juice-quality evaluations of the first three years are followed by simple nonreplicated yield tests on commercial estates before a series of replicated yield trials conducted at the station. The seedlings are space planted.

3624 *González-Ríos, P. Development of sugarcane breeding in Puerto Rico.* (*pp. 732–42*).
An account is given of breeding in Puerto Rico since 1913. Particular attention is being given to breeding for mosaic resistance.

3625 *Weetman, L. M. & Hundertmark, B. W. Differences in varietal responses on inside and outside rows of small sugarcane plots.* (*pp. 743–45*).
Twenty early varieties and twenty late varieties were planted in four-row plots, and yield comparisons (tons of sugar per acre) were made between the outer (border) rows and the two inner rows. In the late varieties the yields of the border rows were consistently higher for plant cane but five varieties had reduced yields in the ratoon crop. In the early varieties the border rows outyielded the inner ones in both plant cane and ratoon crops. Differences due to border effect were highly significant for both crops in the early and late varieties and border x variety interactions were also highly significant.

3626 *Loh, C. S. Progress report on the development of P.T. seedlings in Taiwan.* (*pp. 746–50*).
Five new strains in the PT series [cf. XXVII, 728] have been released from the Taiwan Sugar Experiment Station, Ping Tung. These are 50–2, 51–11, 51–204, 51–342 and 52–00. The parentage of these and other PT varieties, some of which have not yet been released, is presented diagrammatically.

3627 *Panje, R. R. & Ethirajan, A. S. Studies in* Saccharum spontaneum*—preliminary studies in inbreeding.* (*pp. 751–54*).
Selfed progenies were obtained from a number of *S. spontaneum* stocks. Five of the stocks were superior in vigour, tillering capacity and growth habit, three were highly resistant to red rot (*Physalospora tucumanensis*), three had a high sucrose content and one combined all the characteristics of the others. No loss of vigour resulted from inbreeding and some progenies had improved leaf and stem characters. The order of flowering noted for the parents was maintained in the progenies but the propensity for flowering was, with one exception, reduced; flowering was completely suppressed in some lines. In all progenies that produced flowers, flowering was delayed; all were completely self fertile however. Selfing was also carried out in (1) a variety exhibiting protogynous and (2) one

with replicated flower parts. In (1) the protogynous character was found in 5 out of 12 seedlings obtained, but in (2), no seedlings produced abnormal flowers. Resistance to red rot was tested in selfed seedlings from resistant parents. Within the restricted populations tested, considerable variation was exhibited; only two of the parents produced progenies equal to them in resistance. Selfed seedlings from high-sucrose lines also exhibited wide variation, some showing great improvement over parental strains while others were inferior. On the basis of results obtained from this selfing programme, ten S_1 clones have been selected for further inbreeding.

3628 *George, E. F. Effect of the environment on components of yield in seedlings from five* Saccharum *crosses.* (*pp. 755–65*).

Seedlings from five crosses were grown at four substations in contrasting climatic zones in Mauritius. The characters studied were number of tillers, length of longest stem, average diameter of stem and yield of plant cane. Frequency distribution curves for the yield of the five crosses in the different environments show that differences due to genotype are consistent and indicate the selection potential of each cross. While populations of different genetic constitution react differently to different environments, the overall response to a particular environment is the same for all. A study of the relative effects of environment and genotype showed the effects to be different for each character; of the total variation in yield within the five crosses, 60–70% was due to environmental influence. Correlation studies indicate that stem length may prove a useful criterion for assessing yield, although it will not give any indication of the variation present in the population. Mean tiller number, by its constant association with mean yield within any one cross, provides a rapid means of determining to which environment a cross is best adapted.

3629 *Veiga, F. M. Intergeneric cross with sugarcane.* (*pp. 765–68*).

At the Experimental Station of Campos, Brazil, panicles of *Gynerium* sp. and the sugar cane Co. 421 (♀) were brought into contact to facilitate pollination. Three seedlings were obtained, one of which is thought to be a hybrid; the plant tillers vigorously, has rigid dark-green leaves with sharply serrated edges and has very hard stems. The high fibre content of the seedling (23·5%) compared with that of Co.421 (15–16%) is considered to support the assumption that this is a true hybrid.

3630 *Hebert, L. P. Method of determining brix with the hand refractometer in selecting sugarcane seedlings.* (*pp. 768–75*).

Brix values obtained by hand refractometer from juice samples extracted with a Hawaiian punch from the midpoint of five or more stalks per stool were comparable with those obtained from hydrometer measurements on juice expressed by a laboratory mill; it is considered that the method should prove useful in speeding up selection procedures in the early stages of variety selection.

3631 *Panje, R. R. & Jagadees Prasad, P. R. The effects of ionizing radiations on sugarcane.* (*pp. 775–82*).

At the Sugarcane Breeding Institute, Coimbatore, seeds, seedlings and single-budded seed pieces were exposed to various dosages of γ rays and pile and thermal neutrons. Several instances of tissue damage were found but no mutations other than those of plastids were obtained; a dissected-leaf condition which appeared in five treated plants also appeared in an untreated control plant. Some treated plants grew faster than the controls. As measured by the lethal dose, neutrons were 5–6 times more effective than γ rays. Seeds were highly resistant to irradiation but became susceptible to relatively low dosages after germination. For irradiating buds on a large scale, 8000 r. is recommended as a suitable dose; the technical difficulties of treating bulky material are discussed.

3632 *Price, S. & Warner, J. N. The possible use of induced mutations for sugarcane improvement.* (*pp. 782–92*).

It is considered that the kind of induced effect most likely to be of value in sugar-cane improvement is the transference of desirable genes from otherwise undesirable chromosomes, followed by the elimination of the undesirable segments. A parallel is drawn between the *Aegilops* chromosome successfully irradiated by Sears in his *Triticum* x *Aegilops* hybrid [cf. XXVI, 1141] and the *Saccharum spontaneum* chromosomes present in most modern sugar-cane varieties.

In the discussion that followed the presentation of this paper, Stevenson reported heavier flowering in material derived from certain varieties following heat treatment; in particular, the variety Badila, which had flowered only once during a number of years, flowered freely after the treatment. It is not certain whether this represented a mutagenic, cytoplasmic or vernalization effect. Burton remarked that, in

the hybrid referred to, the *Aegilops* chromosome was a univalent; if similar experiments are to be made in sugar cane, then the *S. spontaneum* chromosomes should be similarly univalent.

3633 *Warner, J. N. & Grassl, C. O. The* 1957 *New Guinea expedition for collection of sugarcane.* (*pp. 792–94*).

[Cf. XXIX, 2900–1].

3634 *Röhrig, P. E., Ellis, T. O. & Arceneaux, G. Microclimatic modification by mist sprays within polyethylene enclosures in relation to flowering of sugarcane.* (*pp. 794–801*).

In tests at Romana, Dominican Republic, it was found that, with increase in soil moisture content and atmospheric humidity, an increase occurred in the number of flowering stalks produced by POJ2878 and B42231. However four other varieties which do not normally bloom at Romana also failed under the experimental conditions.

3635 *Babu, C. N. Studies in* Saccharum spontaneum. *Association between stem epidermal patterns and chromosome numbers.* (*pp. 801–05*).

Based on the percentage of paired cork and silica cells per unit area, five patterns of stem epidermis were distinguished: pattern I (81–100% cork-silica pairs), II (61–80%), III (41–60%), IV (21–40%) and V (0–20%). Epidermal patterns were examined in 300 *S. spontaneum* clones representing the distributional range of the species and with chromosome numbers ranging from $2n = 40$ to $2n = 128$. With the exception of the $2n = 40$ and the $2n = 80$ forms, the percentage of solitary cork cells increased with increase in chromosome number. The 40-chromosome types resembled the higher polyploids in having a high percentage of solitary cork cells; all of the six clones examined exhibited pattern V. Among the 80-chromosome forms, about 35% exhibited pattern I, 35% pattern II and the rest were about equally divided between the other three patterns.

3636 *Coleman, R. E. Factors involved in the flowering of sugarcane* (Saccharum *spp.*). (*pp. 805–14*).

The methods used in attempts to induce flowering included controlled day lengths, infrared irradiation, shading and the application of chemicals; the effects of two contrasting climates were also studied. Flower formation was induced in H37–1933 and H44–3098 by a fixed photoperiod of 12 hr. 25 min.; H37–1933 could be kept under noninductive day length from July 15 to September 1 and then induced to flower by exposure to the inductive day length. Infrared irradiation appeared to inhibit flowering in H37–1933. Shading did not induce flowering in nonflowering varieties; nor did it inhibit flowering in normally flowering varieties. The percentage of flowers produced by plants treated with different chemical compounds was not significantly greater than that from untreated plants. The effect of transferring plants from a climate unfavourable for flowering to one which favours flowering was studied; plants which were moved as late as 11 September were able to initiate flowers in the new environment, but flowering percentage was considerably reduced in plants transferred as late as 18 September.

3637 *Rao, J. T. & Krishna Kumari, R. Preliminary observations on the fertility of essential organs in arrows of certain parental sugarcane varieties subjected to photo-periodic treatment.* (*pp. 814–19*).

At the Sugarcane Breeding Institute, Coimbatore, India, flowering was induced in plants which had been "subjected to 4 hours short day treatment after being rendered vegetative by long day treatment" [cf. XXX, 4142]. An examination of the resulting flowers revealed the occurrence of various degrees of male sterility in all of 17 varieties studied. In most of these the pollen grains were in an agglutinated condition and were not shed. Many anthers failed to dehisce and in some cases the stamens were reduced to staminodes. The results of crosses of these varieties with *Saccharum spontaneum* lines chosen for their high pollen fertility indicated that female fertility is also adversely affected by this treatment.

3638 *Panje, R. R. & Srinivasan, K. Studies in* Saccharum spontaneum. *A note on the flowering sequence of* Saccharum spontaneum *clones.* (*pp. 819–24*).

Observations on 200 *S. spontaneum* clones indicated that the date of flowering of individual clones is fairly constant from year to year. Differences between clones were mainly due to differences in the time of formation of the floral primordia. While the date of flowering was generally about 1–2 months after initiation, clones which formed primordia in June produced flowers up to 5 months after initiation. This is thought to be due, at least in part, to deficient rainfall during June and July; the possibility that certain clones may require a longer developmental period is also considered. The clones studied here were derived from the Spontaneum Expedition Scheme collection (SES

clones) and the discussion that followed this paper was mainly concerned with the use of these and other *S. spontaneum* clones in breeding. With reference to an earlier paper [3637], Daniels mentioned that he observed no female sterility or abnormalities of any kind in photoperiod-induced arrows of the Burma type of *S. spontaneum.*

3639 *Gopala Aiyar, K. V. & Chiranjivi Rao, K. Studies on the relation of the chemical composition of cane juices and the quality of jaggery with special reference to the new Co. canes.* (*pp. 825–29*).
In quality tests on 42 Coimbatore varieties (Co. numbers 1232 to 1273), the best quality jaggery was obtained from Co. 1253. Preliminary studies indicate that high quality jaggeries are obtained from juices with low aminoacid nitrogen.

3640 *Agarwal, R. A. & Kandaswamy, P. A. Differential injury to sugarcane by grasshoppers* (Gastrimarcus marmoratus *Thu.*). (*pp. 829–35*).
Damage due to *G. marmoratus* was more severe in varieties with light green foliage than in those with dark green foliage.

3641 *Darroch, J. G. Statistical methods in the selection and evaluation of sugar cane.* (*pp. 836–41*).
The incorporation into the Hawaiian variety-testing programme of Federer's augmented block design [cf. XXVII, 3253] is discussed. Although the area allocated to check varieties has been reduced, the number of varieties and replications has also been reduced, resulting in a reduction in the reliability of error estimates. It is considered that the augmented design shows little promise of any real benefit in Hawaii; the absence of any significant block effect suggests that a completely random arrangement would serve equally well.

3642 *Chiranjivi Rao, K. & Gopala Aiyer, K. V. Fluctuation of starch in Co. 419, Katha, SS. Assam 301 and* Erianthus arundinaceus *at different stages of growth.* (*pp. 841–43*).
E. arundinaceus contained higher amounts of starch in the stem than Katha, SS. Assam 301 and Co. 419 at all stages of growth; Co. 419 had the lowest values. While the range of values obtained from the leaf was lower than that from the stem in *E. arundinaceus* the reverse was true in the three varieties.

3643 *Fors, A. L. An appraisal and history of the Cuban-produced sugar cane varieties.* (*pp. 843–50*).
This historical account of breeding in Cuba ends with a note on some of the varieties being developed by the Department of Agriculture.

3644 *Hebert, L. P. & Matherne, R. J. Yield trends of sugarcane varieties in Louisiana from 1952–56.* (*pp. 850–56*).
Six of the varieties included in these trials had already occurred in comparable trials so that the data on their performance cover an 8-year period. All the varieties gave higher yields at the end of the period than at the beginning; this is attributed mainly to improved weather and cultural conditions during the last four years of the trial. The yields however did not increase at the same rate for all varieties. None of the canes had been heat-treated against ratoon stunting disease and this may have affected the performance of certain varieties.

3645 *Ethirajan, A. S. Some observations on the growth conditions of sugarcane in the world collection at Taliparamba.* (*pp. 857–62*).
Some observations are recorded on the growth and flowering behaviour of some of the varieties in the world collection maintained at the Agricultural Research Station at Taliparamba on the west coast of India.

3646 *Chu, T. L., Leu, L. S. & Bau* [*Pao*], *Y. S. Progress report on the study of the mode of resistance of genus* Saccharum *and its relatives to downy mildew.* (*pp. 1098–107*).
[Cf. XXX, 4144].

3647 *Azab, Y. E. & Chilton, J. P. Inheritance of resistance and susceptibility of sugarcane to the red rot fungus* (Physalospora tucumanensis *Speg.*). (*pp. 1127–29*).
The reactions of 1455 seedlings from 14 crosses involving strains showing various degrees of resistance to *Ph. tucumanensis* are recorded. With the exception of one moderately resistant x moderately susceptible cross (CP29–103 x CP27–108) which gave 43·1% of resistant seedlings, all the crosses gave about the same percentage of resistant seedlings. For example, three resistant x resistant crosses gave 24·5%, three resistant x susceptible crosses gave 30% and two susceptible x susceptible crosses gave 24·5% of resistant seedlings.

3648 *Robinson, P. E. False floral smut of sugarcane.* (*pp. 1137–47*).

At the Macknade Field Experiment Station, Queensland, attempts to utilize the frost resistance of *Saccharum spontaneum* 'Turkmenistan' in developing hardy cane varieties have been abandoned following the discovery that this material and lines and hybrids derived from it are susceptible to a disease designated false floral smut. The disease is caused primarily by *Claviceps purpurea* but the superficial symptoms are due to overgrowth by *Cerebella andropogonis*. The Turkmenistan material is homozygous for susceptibility, which is dominant over resistance. No infection was found on any other material growing near to the diseased stocks and attempts to infect a number of breeding canes by inoculation were not successful.

3649 **1960 Report of the Experiment Station, Hawaiian Sugar Planters' Association** : Pp. 85.

Biparental crosses received a high priority in the programme of hybridization. Cytological investigations of wild and cultivated canes and their hybrids continued. Tests were carried out on varietal reactions to ratoon stunting, *Physalospora tucumanensis*, *Pythium graminicolum* and root-knot nematode.

3650 Martin-Leake, H.
Sugar cane agriculture in Mauritius.
Int. Sug. J. 1961 : **63** : p. 5.

Reference is made to two varieties which have been released for commercial cultivation, M202/46 (Co.281 x M63/39) and M93/38 (Ébène 1/37 x M63/39).

3651 Negi, O. P. & Khanna, K. L.
Comparative stem anatomy of erect and lodging forms of *Saccharum spontaneum*, L.
Indian J. Sugarcane Res. Developm. 1961 : **5** : 75–82.

Anatomical studies of the top, middle and bottom internodes of five resistant and five susceptible varieties show that resistant varieties differ from susceptible types in having fewer but more heavily lignified vascular bundles in the peripheral region of the stem; in the central region, bundle diameter is greater in resistant varieties. In both types there is a gradual reduction in the amount of lignification of vascular bundles passing from the bottom to the top internode. In susceptible varieties the greatest reduction occurs from bottom to middle internodes while resistant types show the greatest reduction from middle to top internodes. A central cavity is present in the middle internode of both resistant and susceptible types; in the latter however it is generally also present in the bottom and top internodes. In resistant varieties a central cavity is either absent or only slightly developed in the bottom internode and may or may not be present in the top internode.

3652 Chona, B. L. & Srivastava, D. N.
Variations in *Colletotrichum falcatum* Went, the causal organism of red rot of sugarcane.
Indian Phytopath. 1960 : **13** : 58–65.

On the basis of cultural characteristics, 32 isolates of *C. falcatum* (*Physalospora tucumanensis*) from northern India were divisible into six groups. Isolates with abundant sporulation and a light-coloured mycelium were more virulent than the other groups. Even within this group, however, considerable variation in the virulence of the different isolates was detected. Germination capacity of the conidia of the various groups was inversely related to degree of virulence. The latter property was also associated with granulation of the conidia, these having a granular surface in the light-coloured, abundantly sporulating group but a hyaline appearance in the other isolates.

3653 Bajaj, B. S. & Dhanraj, K. S.
Mutation in *Colletotrichum falcatum* Went, the causal organism of red rot of sugarcane III. Some biological effects of methyl bis (β-chloroethyl)-amine.
Indian Phytopath. 1960 : **13** : 48–54.

Cultures of *C. falcatum* (*Physalospora tucumanensis*) raised from spores treated with the above substance showed pronounced sectoring. Several variants were isolated for further study.

Beiträge zur Rübenforschung. Nr. 5. (**Contributions on beet research. No. 5**).
Wiss. Abh. dtsch. Akad. LandwWiss. Berlin 1960 : No. 48 : Pp. 74.

3654 *Wöhlert, W. Ist die Saftpolarisation für Serienuntersuchungen in der Zuckerrübenzüchtung geeignet?* (*Is juice polarization suitable for serial investigation in sugar-beet breeding?*) (*pp. 8–22*).

Since the method of pulp polarization for the determination of sugar content is liable to error because of the presence of coarse particles in the pulp, the possibilities of juice polarization have been investigated. Although the difficulty

of determining the juice volume per 100 g. of pulp is a complicating factor, the method is expected to be of some value for serial tests in breeding.

3655 *Curth, P. & Fürste, K. Eine neue Prüfungsmethode für Schossresistenz bei Zuckerrüben.* (*A new testing method for bolting resistance in sugar beet*). (*pp. 29–37*).

Testing in the greenhouse by means of cold treatment lasting three or eight weeks and supplementary lighting to give longer photoperiods gave higher bolting percentages than field tests. Greenhouse tests sown in January showed a better correlation with field tests than those sown in November.

3656 *Schneider, H. Untersuchungen über die Beziehungen zwischen Knäuelgrösse, Reifegrad, Keimfähigkeit und Ploidiestufe bei Zuckerrübensaatgut.* (*Investigations on the relations between cluster size, degree of maturity, germinability and ploidy level in sugar-beet seed*). (*pp. 39–46*).

Polyploid material consisting of a mixture of diploid, triploid and tetraploid seed varies in cluster size, large clusters showing better germination. The percentages of the different ploidy levels vary with year and variety. Large-clustered sieve fractions contain the highest proportion of tetraploids and small-clustered fractions the highest of diploids, while triploids are most frequent in the medium-sized fractions. Cultivation methods which alter the relative proportions of triploid, diploid and tetraploid plants are briefly discussed.

3657 *Curth, P. Erfahrungen bei der Verwendung von Zusatzlicht für die Rübenzüchtung.* (*Experiences in the utilization of supplementary light in beet breeding*). (*pp. 47–55*).

The advantages and drawbacks of various types of lighting installations tested for use in supplementary illumination in greenhouses at the Kleinwanzleben Plant Breeding Institute are discussed.

3658 *Röstel, H.-J. Verlängerung der Vegetationszeit von Zuckerrüben durch Senkung des Keimtemperaturminimums auf züchterischem Wege.* (*Lengthening the vegetative period of sugar beets by lowering the minimum germination temperature by means of breeding*). (*pp. 57–73*).

A method of selecting for ability to germinate at low temperatures (LTG) is described. The percentage germination at 1° to 2° C. increased in successive generations of selection, indicating that the LTG character is heritable. In the selected material there was a good agreement between LTG and field emergence, and first and second generation LTG families showed significant increases in yields of roots and sugar compared with the initial material. A Kleinwanzleben monocarpic type showed good LTG, which suggests that the two characters may be combined without great difficulty. There was generally no correlation between LTG and germination at normal temperatures, except in monocarpic material and Kleinwanzleben E, which both showed a positive correlation. Polycarpic LTG material contained 0·3–4·0% monocarpic seed balls, the remainder being chiefly bicarpic or tricarpic. Generally only one seed germinated per seed ball.

Vorträge anlässlich der 2. Tagung des Arbeitsausschusses für Zuckerrübenforschung der sozialistischen Länder vom 22. bis 24. September 1959 in Leipzig und Kleinwanzleben. (**Lectures on the occasion of the 2nd meeting of the working committee for sugar beet research of the socialist countries, held from 22 to 24 September 1959 in Leipzig and Kleinwanzleben**). Tagungsber. dtsch. Akad. Landwirtschaftsw. Berlin 1960 : No. 24 : Pp. 132.

3659 *Fürste, W. Stand und Probleme der* Cercospora-*Resistenzzüchtung.* (*Position and problems of breeding for* Cercospora *resistance*). (*pp. 11–20*).

Field and greenhouse methods of testing for resistance which have given closely similar results are outlined. After 12 years' selection for unforked roots, delayed lignification and bolting resistance, a *Cercospora*-resistant variety, Kleinwanzleben Cr, developed from a cross with a wild beet, has compared favourably in yield with the standard, Kleinwanzleben N. The advantages of polyploidy are pointed out and include the wide range in reaction to *Cercospora* and in sugar content, allowing greater scope for selection. A 100% monogerm mutant is mentioned as having been recently found. There appears to be some association between *Cercospora* resistance and yellows tolerance.

3660 *Csitkovics, A. & Szirmai, J. Die heutige Lage der Resistenzzüchtung der Zuckerrübe in Ungarn.* (*The present position of resistance breeding in sugar beet in Hungary*). (*pp. 21–29*).

The polyploid Beta Poly 3 is noted as being more resistant than other Hungarian varieties to *Phoma betae*, and is also, together with Beta

Poly 1, one of the varieties most resistant to *Cercospora beticola*. Testing for resistance to the latter is being extensively carried out. Tests have so far failed to reveal any resistance to yellows although intervarietal differences in intensity of infection have been detected. Preliminary tests for resistance to *Peronospora schachtii* have shown differences between lines and varieties.

3661 *Wiesner, K. Aufgaben und Probleme der Vergilbungsresistenzzüchtung bei* Beta-*Rüben. (Tasks and problems of breeding for yellows resistance in* Beta). (*pp. 31–42*).

Two types of resistance to yellows in sugar beet are considered. The first involves the decrease of colonization and propagation rate of the virus vector by making the plants unattractive to it in either leaf colour or leaf form. Wide rosettes giving good ground cover are for example unattractive. This type of plant is frequent among polyploids, and polyploids have in fact been found to be less often infected with yellows.

The second type involves tolerance of yellows infection, tolerance being expressed either as lack of symptoms or as lack of decrease in yield. Among wild species, *Beta lomatogona* and *B. trigyna*, and apparently also, though to a lesser extent, *B. corolliflora*, are resistant to the spread of infection; *B. procumbens* is infected but symptomless; and *B. webbiana* resists infection. Although difficult to cross with cultivated beet, these species may be useful in breeding.

The factors rendering selection according to degree of yellowing difficult are pointed out, and it is suggested that the results of yield comparisons between infected and healthy plants would be a better criterion. To supplement these, serological and chemical tests could be used to throw light on the causes of any yield differences observed. A testing and selection procedure which takes into account the biennial habit of the plant is outlined.

3662 *Curth, P. Aktuelle Fragen zur Züchtung auf Schossresistenz bei Zuckerrüben. (Current problems in breeding for bolting resistance in sugar beet). (pp. 51–64).*

A greenhouse testing method is described. It is found that bolting percentage increases with duration of cold period and with light intensity, light below 13 lux being without effect, and is greatest at 2–4° C. and at day lengths above 15 hr. Wave-length tests showed that orange light is most favourable to bolting, followed by yellow and then blue. Date of bolting advances with increasing length of cold period.

3663 *Heinisch, O. Zur Terminologie in der Zuckerrübenzüchtung. (On terminology in sugar beet breeding). (pp. 71–74).*

The use of the term "monogerm seed" either for commercial seed in which the fruit clusters have been broken into their single segments or for material in which the fruits are genetically single is criticized on the grounds that, with the rare exception of twins, all beet seeds are monogerm. The following terms for the different types of seed material are recommended: monocarpic, bicarpic and polycarpic. It is further suggested that polyploid varieties comprising plants at several levels of ploidy be termed anisoploid, while those with only one level be termed isoploid.

3664 *Sommer, E. Die Beurteilung der technologischen Qualität von Zuckerrüben im allgemeinen. (The evaluation of the technological quality of sugar beets in general). (pp. 75–90).*

A useful criterion for technological quality is the MW factor, which is the amount of molasses per 100 parts of white sugar produced. A method of estimating MW is described which requires only the knowledge of the sugar and ash contents of the beet. The determination of noxious nitrogen content is also discussed.

3665 *Stehlík, V. Die Qualität der Zuckerrübe vom Standpunkt 'des Züchters und Forschers. (The quality of sugar beet from the point of view of breeder and research worker). (pp. 91–98).*

Data on the quality of sugar beet and some of its hybrids with other species or varieties are given. The results of tests in Czechoslovakia show that differences in quality caused by external factors are greater than varietal differences.

3666 *Wöhlert, W. Die verlustarme Lagerung geernteter Zuckerrüben als Problem in der Zuckerrübenzüchtung. (Low-injury storage of harvested sugar beets as a problem in sugar beet breeding). (pp. 99–105).*

The attention of breeders is drawn to the following points: the desirability of smooth roots with shallow root grooves which hinder the retention of soil microorganisms causing decay; the value of early maturity, which diminishes the likelihood of storing immature roots liable to storage damage; and the usefulness of subjecting families to selection in both autumn and spring, i.e. before and after storage.

3667 Schlösser, L. A.
Qualitätszüchtung bei Zuckerrüben. (**Breeding for quality in sugar beet**).
Z. Zuckerindust. 1960 : **85** : 337–41.
An outline is presented of breeding objectives and some results obtained in recent years, reference being made to bolting resistance, the monogerm character, ease of harvesting, technological properties and the use of male sterility.

3668 Zana, J.
Az 1956–58 évi magyar-csehszlovák fajtakísérletek eredményei. (**Results of the Hungarian-Czechoslovakian varietal trials held in 1956–1958**).
Cukor. Kutatóint. Közl. 1959 : **4** : 25–35 : from Hungar. agric. Rev. 1960 : **9** : No. 3 : p. 11. (Abst.).
The performance of the 12 sugar-beet varieties tested varied from year to year and from locality to locality, Beta Poly 1 giving the most consistently good yields.

3669 Mazlumov, A. L.
(**Principal achievements and aims in sugar-beet breeding**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 10 : 3–10. [Russian].
[Cf. XXIX, 4208].

3670 Mazlumov, A. L.
(**Principal achievements and aims in breeding beet for increased yield and sugar content**).
Sahar. Svekla (Sug. Beet) 1959 : No. 10 : 26–30. [Russian].
This report on breeding sugar beet refers to new Soviet varieties now available which yield 5–10% more sugar per ha. than the existing ones. Other recent varieties are monogerm beets from Belaja Cerkov' and Jaltuškov. The practical results obtained in previous years include varieties which combine high root yields with a sugar content of the order of 20·0% to 22·0%, nonbolters, and varieties adapted to different sets of climatic and cultural environments.

3671 Baten, W. D. & Kohls, H. L.
Testing for a difference between two strains of sugar beets by use of a discriminant function.
Quart. Bull. Mich. agric. Exp. Sta. 1961 : **43** : 499–501.
Two strains of sugar beet were differentiated, by means of discriminant function technique, on the basis of data on root weight, percentage sugars and percentage impurities.

3672 Schlösser, L. A., Haufe, W. & Geidel, H.
Zum rechnerischen Ausgleich von Fehlstellen, insbesondere bei Zuckerrübenversuchen. (**On adjustment for missing plants by calculation, especially in sugar-beet trials**).
Z. Pflanzenz. 1961 : **44** : 348–79.
The methods used for allowing for missing plants are discussed and the "normal plant" method is recommended for relatively small experiments when sufficient labour is available. For other conditions a method involving the analysis of covariance is suggested.

3673 Fedorov, A. I.
(**The production of hybrid seed of sugar beet**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 10 : 11–16. [Russian].
Supplementary information on testing different sets of components for the production of heterotic seed is provided [cf. XXX, 4149]. Heterotic hybrids were obtained from crosses between forms of different origins, for instance between varieties from Ramon', Verhnjačka, Jaltuškov or Uladovo. Some heterotic hybrids from the Institute of Sugar Beet are listed, 17 of these being hybrids between two varieties while five are multiple hybrids. Some hybrids have 2–15% higher sugar yields per unit area than the higher yielding parent, other hybrids had higher sugar contents. Hybrid seed, including that obtained from crosses between monogerm beets and ordinary varieties, had improved viability and germination rate. Work on the production of sugar-beet inbreds is in progress at Uman'.

3674 Kostecki, J.
Metody testowania rodów buraków cukrowych w hodowli heterozyjnej. (**Methods of testing sugar-beet parents in breeding for heterosis**).
Postępy Nauk Roln. 1959 : **6** : No. 6 : 97–106.
The concept of general combining ability and the methods of determining it are explained. Various systems of arranging the parent plants in polycross tests and of controlling pollination are described; special mention is made of certain techniques employed in the USA for this purpose and for vegetative multiplication of selected roots. The writer is of the opinion however that for the production of élites in large quantities the method of self pollination is more effective.

3675 Grin'ko, T. F.
(The problem of method in breeding heterotic varieties of sugar beet).
Sahar. Svekla (Sug. Beet) 1959 : No. 12 : 32–36. [Russian].

A method of producing heterotic hybrids of sugar beet developed at Verhnjačka, now known as the Čerkassk Agricultural Research Station, is described. It consists of (1) single plant selection for two generations, (2) pedigree reproduction for three generations, (3) pedigree tests in crosses for combining ability in the F_3, and (4) single and double crosses between selected sets of pedigree lines.

Information is provided on the root and sugar yields and sugar content of the experimental material.

Most selected pedigree lines approximated R06 in root yield and had a higher sugar content and sugar yield. On crossing, these showed marked heterosis.

3676 Donà dalle Rose, A.
Aberrazioni cromosomiche ed anomalie somatiche da radiazioni ionizzanti su glomeruli di barbabietola da zucchero. **(Chromosome aberrations and somatic anomalies from ionizing radiations on sugar-beet glomerules).**
Industr. saccar. ital. 1959 : No. 9–10 : 412–17.

[Cf. 3098].

3677 Sevost'janov, S. P. & Eleckaja, L. E.
(Special points in breeding the *Cercospora*-resistant sugar-beet variety P028).
Agrobiologija (Agrobiology) 1959 : No. 6 : 908–11. [Russian].

[Cf. XXX, 630].

3678 Bandlow, G.
Pollensterile Zuckerrüben. **(Pollensterile sugar beets).**
Dtsch. Landw., Berl. 1961 : **12** : 81–83.

Pollen sterility in sugar beet and its use in heterosis breeding are described.

3679 Ruebenbauer, T. & Schultis, L.
Zastosowanie selektywnego gametocydu FW 450 dla chemicznego kastrowania kwaitów buraka. **(Application of the selective gametocide FW450 for chemical emasculation of beet).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 199–204.

Plants of sugar beet of the N type were grown surrounded by 8 beetroot plants and the plot was isolated by surrounding it with hemp plants. A certain number of plants were also grown in pairs under isolators. The beetroot plants were sprayed with solutions of sodium 2,3-dichloroisobutyrate of varying concentrations. In control tests without spraying, the progeny of the sugar beets contained 79·3% of coloured seedlings, which are ascribed to cross pollination; the amount was reduced to 30·5% by one treatment with a 3% solution and to 6% by two treatments. A certain amount of damage to the plants resulted from solutions of this concentration and the treatment recommended is two sprayings with solutions of 0·5–1·5%.

3680 Łachowski, J.
Badania wartości użytkowej odmian buraków cukrowych o kłębach jedno- lub dwunasiennych uzyskanych drogą hodowli. **(Studies of the practical value of monogerm and bigerm sugar-beet varieties obtained by means of breeding).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 377–95.

Data on the polyploid monogerm variety Poly Mono IHAR, the diploid bigerm variety Bi IHAR and two standard varieties are given. The two named varieties were both developed at the Polish Institute of Plant Breeding and Acclimatization; the first equals diploids of the E type in root yield and sugar percentage while the second equals N types in root yield but Z types in sugar yield. Bi IHAR also shows the lowest bolting percentage.

3681 Schlösser, L. A.
Der Weg zu natürlichem Monogerm-Saatgut. **(The way to natural monogerm seed).**
Zucker, Hannover 1960 : **13** : 562–64.

The possibilities of breeding monogerm beets by hybridization with wild species or, preferably, with monogerm mutants of cultivated beet are discussed. Lines developed at Kleinwanzleben combine the monogerm character with satisfactory yield, but require further selection for improved seed production and fruit size. Fruits should be of medium size, with a sufficiently thick pericarp to permit water storage, thus promoting germination under conditions of spring drought.

3682 Orlovskij, N. I.
(The breeding and seed production of monogerm sugar beet).
Agrobiologija (Agrobiology) 1959 : No. 6 : 846–51. [Russian].

This account of breeding monogerm varieties at various Soviet institutes mentions recent

Ukrainian trials of Belaja Cerkov' 112 and Jaltuškov 552, which yielded as much sugar per unit area as the highly productive standard varieties from Ramon'. Recent trends in improvement of monogerm beets include (1) mixed sowing of monogerm varieties of different origins combined with selection and (2) intervarietal hybridization of monogerm beets with ordinary varieties. Method (1) is practised at Jaltuškov and method (2) at the All-Union Sugar Beet Institute in Kiev. A table shows the efficacy of the latter method as the hybrids of the monogerm variety Belaja Cerkov' with R06 and L925 had invariably higher root and sugar yields than the monogerm component. The most productive hybrids were those where Belaja Cerkov' was employed as the pollen parent.

3683 Sevost'janov, S. P.
(Monogerm sugar beet and the prospects of its introduction).
Sahar. Svekla (Sug. Beet) 1959 : No. 12 : 22–23. [Russian].

Breeding monogerm varieties adapted to local climatic and soil conditions has begun at Čerkassk, L'gov, Ramon' and several other institutes. However, the monogerm varieties from Belaja Cerkov' and Jaltuškov, which have been made standards in many districts of the Ukraine, are still superior; their root and sugar yields in 1957 and 1958 approximated those of multigerm varieties; they are also being crossed with highly productive multigerm beets, the aim being to obtain heterotic seed. The seed of a hybrid derived from the monogerm beet from Jaltuškov is now available for trials.

3684 Holly, I.
Tömegvizsgálati módszer a répa rosttartalmának gyors meghatározására. **(A mass analysis method for the rapid determination of fibre content in beet).**
Cukoripar, Budapest 1960 : **13** : 69–71; from Hungar. agric. Rev. 1960 : **9** : No. 3 : p. 11. (Abst.).

This method, useful for breeders, involves (*a*) the determination of total dry-matter percentage by means of a Zeiss refractometer, (*b*) the determination of total soluble dry matter percentage and (*c*) the subtraction of the latter value from the former.

3685 Van, Š.-I. [Wang, S.-I.].
(Sugar beet at Tungut).
Sahar. Svekla (Sug. Beet) 1959 : No. 10 : 45–47. [Russian].

The Soviet varieties Ramon' 632, Ramon' 1537 and Verhnjačka 1612 had higher root and sugar yields than introductions from other countries tested at the Tungut agricultural research station in the north-eastern region of Tibet at 3400 m.

3686 **Sugar beet crosses are nematode resistant.**
World Fmg., Kansas City 1961 : **3** : No. 1 : 16–17.

Colchicine-induced 4*x* sugar beets have been crossed with nematode-resistant *Beta patellaris* (4*x*) at the Beet Sugar Development Foundation of the US Department of Agriculture, Salt Lake City, Utah. Tetraploid sugar beets have also been successfully crossed with the diploids *B. webbiana* and *B. procumbens*. The BC_1 with sugar beet has been raised.

3687 Russell, G. E.
Sugar-beet yellows: further studies on viruses and virus strains and their distribution in East Anglia, 1958–59.
Ann. appl. Biol. 1960 : **48** : 721–28.

The results described suggest that breeding for tolerance of sugar-beet mild yellowing virus (SBMYV) may be at least as important economically in East Anglia as breeding for tolerance of yellows virus (SBYV). A brief account of breeding for tolerance of both viruses now in progress at the Plant Breeding Institute, Cambridge, is included. Field trials have indicated that a small proportion of breeding lines were tolerant of both viruses. Some evidence has also been obtained that breeding lines differ in tolerance of different strains of SBYV.

STIMULANTS

3688 **Tobacco Division. Progress Report of the Experimental Farms Service Canada Department of Agriculture for 1954–1958** : Pp. 32.

In breeding cigar tobacco for resistance to black root rot (*Thielaviopsis basicola*), Resistant Havana 211 and Nicot's low-nicotine variety 706 have been used as sources of resistance to develop resistant strains of Connecticut Havana 38, Comstock Spanish and Pennsylvania Broadleaf. *Nicotiana debneyi* has also been utilized as a resistant parent, but progress in obtaining satisfactory plant types has been slow. In breeding Burley tobacco, resistance derived from Harrow Velvet and Burley 1 and 21 has been incorporated in Judy's Pride, Kelly and Halley's Special. Variety 706 has been used as

a source of near immunity from both black and brown root rots, but it has the disadvantage of imparting an off-flavour to the tobacco when air cured. Selection for low content of nicotine is being effected in several strains involving variety 706 in their origin; it is expected that the superior resistance to root rot and the milder smoking quality of this parent will be successfully transferred to Burley. In breeding flue-cured tobacco, segregates in back crosses having 706 as nonrecurrent parent have shown a high degree of resistance to black root rot, but further back crossing to the susceptible parents to improve leaf characters and plant type is required, together with continued selection for resistance.

In breeding for mosaic resistance, the Ambalema type of resistance has been largely replaced by the dominant type of resistance found in *N. glutinosa*. Although highly resistant strains were obtained by using Ambalema, the progenies were low in yield and quality because of thick, narrow leaves, low leaf number and susceptibility to wilting even in cloudy cool weather. Addition of the *N. glutinosa* type of resistance has to a considerable extent corrected these undesirable features, and resistant selections of flue-cured, Burley and cigar tobaccos are being tested for yield and quality with more favourable results.

Some progress has been made in developing earlier maturing varieties of flue-cured and cigar tobacco, suitable for regions where the growing season is shorter with a reduced frost-free interval and lower average temperature than in the longer established areas of cultivation in south-western Ontario.

Burley selections developed at the Harrow Station and cigar tobaccos bred at Ottawa have been analysed for alkaloid content, in the project on the development of varieties with low alkaloid content, particularly of nicotine. The character of low-nicotine content has been introduced from Nicot's 706, but recently low-nicotine plants have been selected in several other foreign and domestic varieties. Genetical studies of these sources of low alkaloid content are being undertaken.

Analyses of Canadian flue-cured tobacco have frequently shown that the better grades are associated with low calcium content. Three varieties relatively low in calcium content have been selected for this property; preliminary tests of several selections gave encouraging results.

Attempts to develop commercially acceptable chlorophyll-deficient strains of cigar, flue-cured and Burley tobacco continued. The pale-yellow leaf colour of the chlorophyll-deficient type is controlled by one pair of recessive genes; the character was first observed in the South American variety Consolation.

R_2 progenies derived from seeds exposed to X rays and Co^{60} are being screened for early maturity and disease resistance in the field.

In an attempt to break the close linkage between the mammoth character and short-day reaction, seeds of Burley, flue-cured and cigar tobacco of the mammoth type have been treated with X rays.

A rapid quantitative test for alkaloids in fresh or cured leaves, suitable for use in field or laboratory, has been developed. "The turbidity of a cleared aqueous leaf extract containing added silicotungstic acid can be visually estimated quantitatively." The method entails several minutes per sample and is especially useful for classifying in the field plants segregating for alkaloid content.

In flue-cured tobacco, intervarietal differences in tensile strength of the leaves were not significant.

3689 Berbeć, J. & Drzas, E.
Badania nad wartością jakościową niektórych krajowych odmian papierosowych tytoniu. (**Studies on the quality of some native varieties of cigarette tobacco**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 449–76.

Data are given on the chemical composition and commercial quality of the Polish varieties Virginia Kaznowski, Złotolistny IHAR [Golden-leaved Institute of Plant Breeding and Acclimatization] and other strains, as compared with the standard Virginia Joyner. Virginia Kaznowski was closely similar to the standard, although differing in cultivation requirements.

3690 Povilaitis, B.
Performance of flue-cured tobacco varieties in 1959.
Lighter 1960 : **30** : No. 4 : 25–29.

Information is given on six commercial varieties and six advanced breeding lines tested at the Tobacco Substation, Delhi, Ont., with respect to agronomic characters and physical and chemical properties affecting quality. The lines originated from Delcrest x Vamoor 50, Virginia Gold x Hicks or Delcrest x Yellow Special A.

3691 Stines, B. J. & Mann, T. J.
Diploidization in *Nicotiana tabacum*.
J. Hered. 1960 : **51** : 222–27.

Twenty normal green varieties were crossed

with the Burley tobacco Ky16 (yb_1by_1 yb_2yb_2) to determine whether they differed from Burley by duplicate factors or a single factor. Ratios in the F_2s test back crosses to Ky 16 indicated that 18 of the varieties still possessed the unmodified duplicate dominant condition. The two exceptional varieties, Posey and Catterton, gave monohybrid ratios in the F_2 and test back cross. Monosomic analysis and use of two tester lines (Yb_1yb_2) and yb_1Yb_2 demonstrated that each of these varieties was recessive at the yb_2 locus on chromosome O. When crossed with tester Yb_1yb_2, Bottom Special gave unexpected ratios in both the F_2 and test cross. It is postulated that the parent plant of Bottom Special was heterozygous for locus Yb_1 on chromosome B as a result of mutation from Yb_1 to yb_1, a possible case of incipient diploidization thus being detected.

3692 Toskov, N. & Spasov, K.
(New heterosis combinations in tobacco).
Bălg. Tjutjun (Bulg. Tobacco) 1959 : **4** : No. 9 : 373–77 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 101 : p. 71. [Bulgarian]. (Mimeographed).

Kozarsko 541 x Hermanli basma 163 and the reciprocal and Kozarsko 541 x Kulsko seme and its reciprocal ripen at the same time as their parents but are superior in size, having thicker stems and better developed root systems; the hybrids outyield both parents. Hermanli basma 163 x Kozarsko 541 and the reciprocal are more aromatic and have better flavour than Hermanli basma 163 and are similar to Kozarsko 541. Kozarsko 541 x Kulsko seme and the reciprocal have a strong flavour; this combination is suitable for cultivation in flat land and Hermanli basma 163 x Kozarsko 541 is suitable for the heavy soil of the Polujaka region and part of the Plovdiv plain.

3693 Niaz Ahmad & Sultan Ahmad Termazi
Heterosis in tobacco.
Pakist. J. Sci. 1960 : **12** : 74–82.

Considering the averages of the data obtained at Lyallpur, W. Pakistan, from the F_1s of 12 intervarietal crosses of *Nicotiana tabacum* and from the parents, heterosis was expressed in most of the nine characters studied, including plant height, leaf number, capsule number and yield of mature leaf. The occurrence and degree of heterosis for the different characters depended, however, on the cross. Deep Coloured x Puccard Medium showed the highest amount of heterosis for leaf yield, producing 102·73 oz. per plant more than the better parent. The results are considered to be encouraging from the point of view of the commercial exploitation of hybrid vigour in tobacco in West Pakistan.

3694 Lea, H. W.
The quest for a blue mould resistant tobacco.
Agric. Gaz. NSW 1960 : **71** : 639–42.

As a result of a programme involving back crossing of amphidiploid *Nicotiana debneyi* x *N. tabacum* to *N. tabacum* 'Hicks', lines showing promising resistance to *Peronospora tabacina* have been developed and are undergoing tests in Australia and the United States.

3695 Gerstel, D. U.
Genetic instability in polyploid hybrids between tobacco and its ancestral relatives.
J. Elisha Mitchell sci. Soc. 1960 : **76** : p. 184. (Abst.).

"Genetic instability has frequently been reported in hybrids between species of *Nicotiana*. Present evidence indicates that instability can also be found among the derivatives of hybrids between *N. tabacum* and its closest relatives. This was first suspected when amphiploids *N. tabacum* x *N. tomentosiformis* gave for most loci segregation ratios which were not only smaller than the 5 : 1 gametic output normally expected but even smaller than the 3·7 : 1 ratio obtainable only from chromatid segregation. Cytological or mutational change from the dominant to the recessive condition could explain the excess of recessives. Evidence for such instability was found not infrequently. A typical example was an amphiploid from fasciated tobacco and normal *N. tomentosiformis* which had fasciated and normal sectors, and thus had lost in parts of the plant the normal factor from *N. tomentosiformis*. Striking evidence for instability was observed in progenies from amphiploid *N. otophora*, relative of *N. tomentosiformis*, and tobacco. An amphiploid of coral tobacco and *N. otophora* yielded in the testcross with recessive coral tobacco 12 coral and 128 carmine segregants. All but 9 of the carmine plants were variegated carmine-coral; i.e., they were instable for the *N. otophora* colour gene. In a similar testcross of amphiploid albino tobacco x *N. otophora* there were albino and green segregants; among 1887 green offspring, 12 were green-white chimaeras—here the chlorophyll factor from *N. otophora* was instable only in a small minority of plants. The relations between these various observations and the extent to which instability is mutational or chromosomal requires investigation. Of particular interest is the question whether the genes of the wild species only are

instable, or whether markers from tobacco may equally be affected."

3696 GERSTEL, D. U.
Segregation in new allopolyploids of Nicotiana. I. Comparison of 6x (*N. tabacum* x *tomentosiformis*) and 6x (*N. tabacum* x *otophora*).
Genetics 1960 : **45** : 1723–34.

Segregation ratios were determined in (1) 6*x* (*N. tabacum* x *N. tomentosiformis*) for *Fs, Pb, Wh, Ws, Yb* and *Yg* and (2) 6*x* (*N. tabacum* x *N. otophora*) for *Co, Fs, Pb, Ws, Yb* and *Yg*, in crosses of the amphiploids with *N. tabacum* testers. Amphiploid (1) gave consistently smaller ratios than (2). This finding favours *N. tomentosiformis* as being a closer relative of *N. tabacum* than *N. otophora*, in so far as chromosome homology is concerned, but the drawing of any conclusion should be postponed for the following reasons. The ratios for (1) were always smaller than the 5 : 1 ratio expected for amphiploids synthesized from two very closely related species. In general, the ratios were even smaller than the 3·7 : 1 ratio expected with chromatid segregation. Ratios for (2) varied widely, from 3·5 : 1 for *Fs* to 10·7 : 1 for *Co*. Further investigations are necessary to determine whether this variability is due to differences in degree of (*a*) differential affinity between chromosomes or (*b*) genetic stability. Cases of somatic instability of *Ws* and *Co* were found in derivatives of (2). [Cf. XXX, 1832].

3697 GERSTEL, D. U.
Chromosomal control of preferential pairing in *Nicotiana*.
Science 1961 : **133** : 579–80.

Amphiploids of *N. tabacum* 'Holmes Samsoun' x *N. tomentosiformis* were synthesized by colchicine treatment. Holmes Samsoun possesses 23 pairs of *N. tabacum* chromosomes and one substituted pair from *N. glutinosa* carrying a dominant gene for mosaic resistance. The amphiploids segregated for this gene in a 59 : 1 ratio. Since the *N. glutinosa* chromosome behaved in a specific manner, this finding lends support to the view that the low segregation ratios (ranging from 2·3 : 1 to 4·7 : 1) characteristically obtained for duplex loci in ordinary *N. tabacum* x *N. tomentosiformis* amphiploids are determined by the individual chromosomes, instead of being under genic control. Additional evidence in support of this view was provided by a study of an amphiploid between Burley 21, a variety carrying mosaic resistance in a relatively small *N. glutinosa* segment in a chromosome of *N. tabacum*, and *N. tomentosiformis*. Seed from the test cross to susceptible tobacco germinated poorly and only 41 plants were secured from 270 seeds. All 41 plants contained the factor for resistance; the interchange chromosome therefore exhibited pronounced differential affinity. This amphiploid gave 36 green plants and 16 with the burley character of white stem, this result being in striking contrast to the 41 : 0 segregation for mosaic resistance, but similar to typical segregation ratios of other *N. tabacum* x *N. tomentosiformis* amphiploids.

3698 ALCARAZ MIRA, E.
"Rein", une nouvelle mutation apparue dans *N. tabacum*. **(Rein, a new mutation of *N. tabacum*).**
Coresta, Paris 1960 : No. 4 : 14–16.

A mutant designated *rein* and found in Hybrid 254–D (White Burley x Valencia) at the Tobacco Biology Institute, Seville, Spain, is described. The main effect of the mutation is upon the leaf, which is very broad and asymmetrical with practically no midrib. The mutation has a variable phenotypic expression. When it is fully expressed, the stamens are malformed and sterile; a little viable pollen is however produced towards the end of the flowering season.

3699 PERFANOV, G. & GĂLĂBOV, S.
(Tobacco breeding in the Džebel region).
Bălg. Tjutjun (Bulg. Tobacco) 1959 : **4** : No. 9 : 373–77 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 99 : p. 70. [Bulgarian]. (Mimeographed).

Two new varieties of Džebel basma are described. Džebel 190 gives an average yield of leaf of 1607 kg./ha., 30% of this being in class I–III and Džebel 174 yields 1565 kg./ha. with 45% in class I–III. Both varieties are more profitable to raise than standard varieties.

3700 SAND, S. A.
The pedigree of Connecticut 49 shade tobacco.
Bull. Conn. agric. Exp. Sta. 1960 : No. 630 : Pp. 12.

A detailed historical account is presented of the development of Connecticut 49 at the Connecticut Agricultural Experiment Station, now the most widely grown shade tobacco in the Connecticut Valley. The work described covers a period of nearly 40 years. The variety represents the recombination of characteristics from broad-leaf, Sumatra and Cuban tobaccos in a single inbred type. Initiated by research on quantitative inheritance by E. M. East, the programme comprised the development of (1) Round Tip from Sumatra x broad-leaf tobacco,

(2) experimental strains I and M from Round Tip x Stewart Cuban, (3) Conn. G4 from I x M, and (4) Conn. 49 from a cross between Conn. G4 and an inbred probably derived from a Cuban x broad-leaf hybrid. Into the recombination of Sumatra and broad-leaf germ plasm produced in stage (1), genes from Cuban were incorporated during stages (2) and (3) and additional genes from broad-leaf tobacco in (4).

3701 Anitia [Aniția], N. & Ioan, I.
Les caractéristiques morphologiques fondamentales pour la description botanique du tabac. (**The fundamental morphological characteristics for the botanical description of tobacco**).
Coresta, Paris 1960 : No. 4 : 17–32.

In 1959, the Scientific Commission of CORESTA [Cooperation Centre for Scientific Research relative to Tobacco] prepared a standard index card for describing tobacco. This paper, contributed to the index-card catalogue, gives definitions of the morphological data used for describing cultivars in Rumania.

3702 **New one-sucker tobacco varieties now available.**
Crops & Soils 1961 : **13** : No. 5 : p. 19.

KY163 and KY164 are respectively highly resistant and moderately resistant to *Thielaviopsis basicola*. The varieties are being released from the Kentucky Agricultural Experiment Station, Lexington, Ky.

3703 Carstens, H. & Seehofer, F.
How Virginia SCR is obtained and cultivated in the Federal Republic of Germany.
Coresta, Paris 1960 : No. 3 : 39–43; also in French.

An account is given of the development of the above brown-vein resistant variety by mass selection of VN1.

3704 Papaioannou, C.
Contribution à l'étude de l'action des substances mutagènes: isosulfocyanate d'allyle et colchicine, sur le métabolisme auxinique et conséquences génétiques. (**A contribution to the study of the action of the mutagenic substances allyl isothiocyanate and colchicine on auxin metabolism and genetic effects**).
Ann. Inst. exp. Tab. Bergerac 1960 : **3** : 513–56.

Investigations on the effect of allyl isothiocyanate (AIS) and colchicine on the growth of *Avena* coleoptiles and on cell metabolism are reported. Differences were observed in the growth of five lines of *Nicotiana* spp. treated with colchicine; it is suggested that these differences in response are controlled by genetic factors. A completely sterile haploid plant was produced by treating *N. tabacum* with AIS. Meiosis in the haploid was markedly aberrant. At metaphase, total asyndesis was observed in 75·71% of the cells examined, while in the remainder there were 1–5 bivalents. A number of other AIS-treated tobacco plants showed deviations in earliness, flowering, fertility and meiotic behaviour. Varying numbers of polyploids were produced by treating six lines of *Nicotiana* spp. with colchicine; in the case of *N. tabacum* 'P48', the most effective treatment consisted of a 0·5% solution applied for 24 hr. A highly fertile amphidiploid was produced by treating *N. tabacum* 'Corolle double X' x *N. sylvestris* with colchicine.

3705 Kinpyo, T., Fujihara, T. & Mizuno, T.
(**Studies on fresh tobacco leaf. XV. A comparison of the composition of yellow sorts as affected by variety and soil type. 2**).
Shizuoka Daigaku Nogakubu Kenkyu Hokoku/Bull. Fac. Agric. Shizuoka Univ. 1959 : **No. 9** : 47–51. [Japanese].

Further data, with special reference to the effect of soil differences and level of leaf insertion, are presented, in continuation of studies already summarized [XXIX, 4233].

3706 Mangin, H.
Essais d'amélioration par hybridation des variétés algériennes de tabac. (**Attempts at improving Algerian tobaccos by hybridization**).
Station Expérimentale Agricole d'Isserville, Algérie undated : Pp. 12.

Descriptions are given of 12 new hybrids developed at the Agricultural Experiment Station of Isserville, Algeria. The most promising hybrids were those having the Rumanian variety Banat as one parent. The new strains are being observed for maturity and wind and drought resistance prior to large-scale testing.

3707 Aach, H. G.
Vergleich des Eiweissanteiles des Wildstammes vom Tabakmosaikvirus mit dem einer Temperaturmutante. (**A comparison of the protein constituent of the wild strain of the tobacco mosaic virus with that of a temperature mutant**).
Z. VererbLehre 1960 : **91** : 312–16.

The *thermophilum* mutant was isolated from

tobacco plants infected with the common strain of the virus and cultured at 35° C.; its protein contained one more threonine residue and one less isoleucine or leucine residue per polypeptide chain of 17500 molecular weight than protein of the common strain.

3708 Carvalho, A.
Linkage in *Coffea arabica*.
Nature, Lond. 1961 : **189** : 685–86.
Linkage is reported between the dominant gene *Am* for the mutant *anormalis* and recessive gene *an* for the mutant *anomala*. It is noted that these two genes, which are responsible for fairly similar phenotypes and which have an intensive pleiotropic effect on growth and morphology, are the only ones for which linkage has so far been detected in *C. arabica*.

3709 Thomas, K. M.
Station selections.
Indian Coff. 1960 : **24** : 18–19, 27.
Information is provided on selections of coffee developed at the Coffee Research Station, Balehonnur, India, and showing improvement in resistance to *Hemileia vastatrix*, yield and other respects. They comprise older varieties, such as S795, S645 and S288, and the newer selections forming the BA series.

3710 Rodriguez, C.
Actividade do Centro de Investigação das Ferrugens do Cafeeiro. (**Activity of the Coffee Rust Research Institute**).
Agricultura, Lisboa 1960 : No. 6 : 38–44.
Selections of *Coffea arabica* which have shown promising resistance to *Hemileia vastatrix* are S6 Cioiccie, S12 Kaffa and S4 Agaro. Certain lines of *C. canephora, C. liberica, C. eugenioides* and *C. carrissoi* showed resistance to all known physiological races of the pathogen [cf. XXX, 2999].

3711 Destrez, J.
Premières recherches sur le cacaoyer à Madagascar. (**Initial investigations on cacao in Madagascar**).
Agron. trop., Nogent 1960 : **15** : 657–60.
A brief description is given of the cacao-breeding and selection programme at the Ambanja Agricultural Research Station.

3712 Pandey, K. K.
Incompatibility system in *Theobroma cacao*.
Amer. Nat. 1960 : **94** : 379–81.
It is suggested that competitive interaction between *S* alleles is the genetic mechanism responsible for the self incompatibility of *Th. cacao* hybrids derived from two different self-compatible populations. The existence of two independent loci, as proposed by Cope [cf. XXVIII, 3274], is considered to be unnecessarily complicated.
"The incompatibility system in *T. cacao* though functionally sporophytic, lies between sporophytic and gametophytic systems and is theoretically still close to the latter, from which it probably originated through interspecific hybridization. This course of evolution is suggested by the results obtained in Oenothera hybrids. Under the influence of some alien cytoplasm, particularly that of a self-compatible species, the activities of certain units of an *S* allele complex, from a gametophytic species, may begin precociously (premeiotically), thereby making the *S* allele partly sporophytic and partly gametophytic. In *T. cacao* the interaction between *S* allele complexes, which leads to sporophytic reaction, is limited to the units controlling the production of specific growth substances, there being no interaction between the units controlling the production of specific incompatibility precursors, which remain strictly gametophytic in action. This leads to simple gametophytic reaction of the pollen-tubes and embryo-sacs."

3713 Bouharmont, J.
Recherches cytologiques sur la fructification et l'incompatibilité chez *Theobroma cacao* L. (**Cytological researches on fruiting and incompatibility in *Th. cacao* L.**).
Sér. Sci. INÉAC 1960 : No. 89 : Pp. 117.
Self-sterile clones were identified by a method based on the presence of nonfused gametes in ovaries collected four days after selfing. All of the Forastero clones examined were self fertile but Trinitario types included a high proportion of self-sterile clones. It is considered that the self incompatibility is of the homomorphic gametophytic type and, in the populations studied here, can be explained on the basis of two alleles at the *S* locus.

3714 Dračevskij, K.
(**We shall have home-produced chocolate!**)
Les. Hoz. (Forestry) 1960 : No. 9 : p. 93. [Russian].
Mention is made of successful introduction of cacao for cultivation under glass at the Gagra branch of the Main Botanic Garden in the Caucasus.

3715 Glendinning, D. R.
The relationship between growth and yield in cocoa varieties.
Euphytica, Wageningen 1960 : **9** : 351–55.

Data from trials of ten varieties at Tafo, Ghana, show that yield is positively and significantly (0·1% level) correlated with the reduction in growth rate occurring when the tree comes into bearing. This suggests that the equation "growth rate before bearing = growth rate while bearing + yield" will serve as an approximation which may be useful in the early selection of potentially productive trees. One-year and two-year trials at a number of localities show that the same varieties tend to be among the best at all sites.

3716 Duchnowska, A. & Pawełczyk, E.
Analiza kolekcji maku lekarskiego jako wstęp do hodowli odmian morfinowych. (**Analysis of a collection of medicinal poppies as a preliminary step in breeding opium poppies**).
Biul. Inst. Roślin Leczn. 1960 : **6** : 31–42.

Among 30 Polish and introduced varieties tested during 1956–58, only about 10% had capsules with a morphine content higher than 0·3%. Morphologically uniform varieties were not necessarily uniform in morphine content, the good variety Hatvani, for example, which has an average content of 0·33%, showing the range 0·18–0·51%. Oil poppies often had a higher morphine content than opium varieties.

3717 Voškeruša, J.
Untersuchungen über den Morphingehalt in Mohnkapseln. (**Investigations on morphine content in poppy capsules**).
Pharmazie 1960 : **15** : 552–58.

In studies of 64 varieties at four stations in Czechoslovakia in 1953–58, south European varieties were lowest in morphine content. Statistical studies of 17 of the varieties showed that genetical variation was highly significant and environmental variation significant. Grey-seeded varieties had a higher morphine content on the average than other varieties, but the differences were not significant. Highly significant correlations were found between seed yield and morphine content per capsule ($r = +0{\cdot}52 \pm 0{\cdot}12$) and between seed yield and oil yield ($r = +0{\cdot}92 \pm 0{\cdot}12$). The Czechoslovakian variety Dubský střibrošedy [Dubský Silver Grey] had a high morphine content and proved to be a good parent, although intervarietal F_1 hybrids mostly showed intermediate inheritance.

3718 Zub, L.
Badania nad przebiegiem kwitnienia chmielu. (**Studies on the course of flowering in hop**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1960 : **4** : 477–92.

Data on varietal differences in date and duration of flowering and the effects of weather are presented for 24 Polish and introduced varieties.

MINOR CROP PLANTS

3719 Obermayer, E., Benedek, L., Visnyovszky, Zs. & Erdei, I.
A magyar fűszerpaprika-nemesítés és vetőmagtermesztés egyes módszertani kérdései és eredményei. (**Questions of method and some results in the breeding and seed production of Hungarian red pepper for seasoning**).
KísérlÜgy. Közl. 1959 : **52C** : 3–23.

Breeding in Hungary since 1918 is surveyed and current work outlined. Diagrams of the following methods are presented: (1) improvement by line selection; (2) combination of desired characters by crossing and back crossing appropriate inbred lines; (3) breeding for virus resistance by means of crossing and back crossing a cultivated variety with a resistant wild type; and (4) improvement of chemical composition of the fruits of cultivated varieties by further selection. Pungent and nonpungent varieties which have been released or show promise are listed. The wide variation in pigment content in pungent land races and the heritability of high pigment content have led to the development of FO3, a high-yielding pungent variety with an appreciably higher pigment content than the best previous varieties. Positive and negative selection for capsaicin content has also been effective.

3720 Odland, M. L.
Inheritance of flower color in *Capsicum annuum* L.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 475–81.

Analysis of crosses of Cherry, Mexico, Danbury and 425.53 indicated that flower colour depended upon three pairs of genes, *Ss*, *Ww* and *Aa*. Plants of the constitution *ss ww aa* have yellow anthers, white petals and white filaments and styles. Purple pigmentation is never developed in any of the plant parts at any time; classification for this genotype may thus be made in the seedling stage. Individuals with genotype *SS ww aa* differ from those with *ss ww aa* only

in having purple anthers. *SS WW aa* plants are characterized by white petals, and purple filaments, anthers and styles, and *SS ww AA* plants by purple petals, filaments, anthers and styles. Dominant *W* does not intensify the purple colour, *SS ww AA* and *SS WW AA* being phenotypically indistinguishable.

3721 Marinkov, E.
(A new heterotic hybrid of red pepper).
Naučn. Trud. selskostopan. Akad. Georgi Dimitrov. Agron. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1960 : **8** : 319–25. [Bulgarian].

Kalinkov 800/7 x Ratounde Green 1071, a high-quality, high-yielding red pepper hybrid, is described.

3722 Kilb, Gy.
Hazai nemesítésű fűszerpaprikafajták mezőgazdasági és ipari értékelése. **(Agricultural and industrial evaluation of home-bred red pepper varieties for seasoning).**
Konzerv- és Paprikaipar, Budapest 1959 : 350–56; 1960 : 31–35 : from Hungar. agric. Rev. 1960 : **9** : No. 4 : p. 15. (Abst.).

Of 12 varieties tested in Hungary in 1955–57, Sz. 137/47, E15 and Sz. 76/48 were the heaviest croppers among the mild Szeged, mild Kalocsa and hot Szeged types, respectively. The Szeged mild types had the largest fruits and the Szeged hot types the highest early yields and highest pigment content. The Kalocsa types, particularly E15, had the highest "pod ratio" and the most favourable "seed ratio", characteristics regarded as valuable in processing.

3723 Nitzany, F. A. [Nitsani, F.] & Tana, E. ['E.].
(Peppers resistant to potato virus Y).
Sadeh (Field)/Hassadeh 1960 : **40** : p. 1030. [Hebrew].

The pepper variety Puerto Rico Wonder has been shown to be resistant to the races of potato virus Y prevalent in Israel. It is, however, susceptible to the cucumber mosaic virus as are all other pepper varieties at present cultivated in Israel.

3724 Cook, A. A.
Syndrome of potato virus Y in progenies from crosses between susceptible Large Bell Hot and two resistant pepper varieties.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 482–85.

According to data on the F_2s and F_1 back-cross progenies derived from combinations of two resistant varieties (P11 and SC46252) with Large Bell Hot, susceptibility to strain PVY–N of the above virus depended upon a single dominant gene. The occurrence of two syndromes, referred to as severe and mild, corresponded to the expected frequency of the dominant allele in the homozygous and heterozygous condition, respectively. No symptoms were exhibited by plants homozygous for the recessive allele. Anther colour (blue *v.* yellow) was inherited independently of reaction to PVY–N.

3725 Dharampal Singh
Cup leaf—a new leaf mutant in rai (*Brassica juncea* Coss).
Curr. Sci. 1961 : **30** : 27–28.

A true-breeding mutant appeared in *B. juncea* breeding material at the Government Research Farm, Kanpur, in 1955–56. The upper leaf surface of the mutant was curved into a cup-like shape due to the incurving of the leaf margin; the pods showed some resistance to shattering. Inheritance studies indicated that the cup-leaf character was controlled by three interacting genes.

3726 Morice, J.
Hérédité de la couleur des fleurs chez le colza *Brassica napus* L. var. *oleifera* Metzger. **(Inheritance of flower colour in rape, *B. napus* L. var. *oleifera* Metzger).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B 1960 : **10** : 155–68.

Segregation data from a large number of crosses indicate that three genes determine flower colour. As was suggested by Sylvén in 1927, *A* and *B* are responsible for the following colours: normal yellow, *AB*; dark orange yellow, *Ab*; pale yellow, *aB*; and pale orange yellow, *ab*. The recessive gene *c* accounts for the creamy white colour but is only effective in the absence of dominant *A*. The *B* locus is inactive in the presence of *aa* and *cc*; thus the double recessive *aacc* invariably has creamy white flowers.
The inheritance of flower colour in other species of *Brassica* is discussed briefly [cf. XVIII, 401 and XXVI, 149].

3727 Craig, B. M.
Varietal and environmental effects on rapeseed. III. Fatty acid composition of 1958 varietal tests.
Canad. J. Pl. Sci. 1961 : **41** : 204–10.

Interstation and intervarietal differences in the

content of fatty acids in the seeds of six rape varieties are reported.

3728 Anubhava Narayan
Inheritance of spininess of capsule in *Ricinus communis*.
Indian J. Genet. 1960 : **20** : 223–26.
A spiny-capsuled variety was crossed with a spineless variety and the spiny character was found to be incompletely dominant. When the spiny variety was crossed with a partially-spined true-breeding mutant designated "less spiny" to distinguish it from the partially-spined hybrids from the first cross, the spiny character was dominant. The spineless condition was also dominant to the less spiny. Monogenic inheritance was found for each of the characters.

3729 **Linseed.**
Indian Fmg. 1961 : **10** : No. 10 : p. 4.
In trials at the Linseed Breeding Station at Nagrota, Kangra, varieties from Canada, Argentina and the USA had better wilt and rust resistance than the standard Punjab variety K2; the latter however was higher yielding and had a higher oil content. LI5665 was virtually immune to powdery mildew and should be useful in breeding.

3730 Merrill, S. (Jun.) & Potter, G. F.
Resistance of shoots of tung varieties to injury from controlled low temperatures.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 270–77.
In 1955, 1956 and 1958, shoots were exposed to temperatures ranging from 30° to 24° F. at intervals during the normal period of bud expansion in the spring in Louisiana. In 1955, shoots were also subjected to temperatures ranging from 22° to 13° F. during the period of tissue hardening in the autumn. Differences in injury were related to disparities in stage of development, standard varieties with the usual time of flowering being much less affected than late-flowering ones by cold during the spring. Generally speaking, varieties relatively free from injury in the spring suffered most in the autumn test. Budded G–46 appeared, however, to be an exception. It had a very low rating for injury in the spring, combined with a moderately low rating in the autumn. Although not highly productive, the most promising late-flowering varieties are being crossed with recommended varieties.

3731 Schulze, J.
Die Prüfung der Kombinationseignung von Inzuchtstämmen der Sonnenblume (*Helianthus annuus* L.) durch Anwendung des Topcrossverfahrens. [**Testing the combining ability of inbred lines of sunflower (*H. annuus* L.) by means of the topcross method**].
Z. Pflanzenz. 1960 : **44** : 135–56.
Some progenies showed good and others poor combining ability in respect of yield of seed with husk, 1000-seed weight, proportion of seed and oil content in top crosses of I_4 and I_5 lines with the variety Ostsonne [Eastern Sun]. The yields of seed and oil were mainly dependent on the yield of seed with husk, there being little variation in the proportion of seed to husk and in oil content. The phenotypic and genotypic correlations between yield and oil content, proportion of seed and 1000-seed weight, and proportion of seed and oil content were significant and positive. The correlations were significant and negative between yield and 1000-seed weight and between 1000-seed weight and oil content. The degree of heritability (h^2) of the general combining ability averaged 0·7 for yield, 1000-seed weight and proportion of seed but for oil content the values differed significantly in the two years of the investigation. Comparison with an empirical calculation showed that the h^2 values were too high, for the interaction between top-cross progenies and experimental years could not be eliminated. Since some of the progenies produced yields considerably higher than those of the test variety, it is concluded that the top-cross method should be used for the production of new hybrids.

3732 Ždanov, L. A.
(The effect of foreign pollen in the pollination of the sunflower).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 9 : 51–62. [Russian].
More vigorous and productive sunflower progenies were obtained by adding the pollen of maize, castor-oil or other plant species to sunflower pollen at the Don research station. Thus the F_1 inbreds of Don 9170 and Don 9957 respectively, to the self pollen of which foreign pollen had been added, yielded more seed and oil and had a higher oil content in the seed than the corresponding F_1 selfed in the normal way. Details are also given of similar improvements in seed and oil yields of the intervarietal hybrids Don 9957 x VNIIMK 8931 [Oil Plants Institute

8931], Don 2543 x VNIIMK 8931 and Don 9170 x Vejdelevka 66.

3733 Prohorov, K. I.
(Annual renewal of varietal seed stocks of sunflower increases the yield of oil per hectare).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 29–30. [Russian].
At Vejdelevka, through the use of seed subjected to annual selection and progeny testing for several years, the oil content and yield of Zelenka 368 were greatly improved; resistance to *Orobanche* was also improved and greater uniformity in maturation and plant height was promoted.

3734 Pawlowski, S. H.
Estimation of oil in safflower seed.
Nature, Lond. 1961 : **189** : 772–73.
An analysis of varieties at the Canada Agriculture Research Station, Lethbridge, Alba., revealed that oil percentage was negatively associated with bushel weight and specific gravity of the seed. Applicable to both small and large quantities of seed, the method of specific-gravity estimation is considered to offer a useful means of evaluating varieties for oil content or of screening segregating populations. Percentage air space inside the seed and oil percentage of the kernel decreased with increasing specific gravity of the whole seed, but hull percentage increased. Although the specific gravity of the hull varied with the variety, it was always greater than that of the whole seed, the close relationship between specific gravity of the seed and hull percentage thus being explicable.

3735 Rylska, T. & Rozegnałowa, L.
Badania nad ewentualną możliwością dziedziczenia cech nabytych na skutek indukcji fotoperiodycznej u rośliny krótkiego dnia *Perilla ocimoides* L. **(Studies on the possibility of the inheritance of acquired characteristics as a result of photoperiodic induction in the short-day plant *P. ocimoides* L.).**
Acta agrobot., Warszawa 1960 : **9** : No. 2 : 63–73.
Inheritance of developmental changes induced by short photoperiod in previous generations was not observed, nor was there any change in successive generations in the number of short days required for induction.

Eighth Annual Report of the West African Institute for Oil Palm Research 1959–60 : Pp. 140.

3736 *Sparnaaij, L. D. Plant Breeding Division. (pp. 82–92).*
The integrated breeding programme, involving *tenera, dura, pisifera* and Deli palms, continued. Several *dura* x *pisifera* progenies have yielded over a ton per acre in the seventh year after planting. Palms from Nigeria and Angola have been utilized in a number of crosses. Progenies derived from crosses in which the male parent was the INÉAC line, *tenera* testeur, have given excellent results. Hybrid progenies of crosses between *Corozo oleifera* (*Elaeis melanococca*) and various types of *E. guineensis* have shown very vigorous growth and a high degree of uniformity. Methods used in the new laboratory for fruit and bunch analysis are described. The results of analyses of selected progenies, including a group of *dura* x *pisifera* crosses, are tabulated.

3737 **Turmeric.**
Indian Fmg. 1961 : **10** : No. 10 : 3–4.
A brief note mentions that varietal differences in susceptibility to leaf spot (*Colletotrichum capsici*) were found in a collection of indigenous and foreign turmeric varieties tested at the Turmeric Research Station, Pedapalem, Andhra Pradesh.

Report of the Wattle Research Institute, University of Natal, for 1959–1960 (1960) : Pp. 48.

3738 *Review of work in progress. (pp. 16–31).*
The F_1 hybrids from green wattle (*Acacia decurrens*) ♀ x black wattle (*A. mearnsii*) ♂ showed a high degree of sterility on selfing and on back crossing to green wattle, but were more fertile when back crossed to black wattle. When black wattle was used as female, sterility was even higher; all hybrids from these crosses however had a common black-wattle seed parent, B5, but different pollen parents, so that the low fertility may be associated with this particular black-wattle tree.
A breeding programme begun in 1950 to incorporate the shorter seed ripening period (4–6 months) of green wattle into black wattle (12–14 months) is now at the BC_2 stage. Trees in this generation flower in September–October as does black wattle. While some plants produce ripe pods in 4–6 months from flowering,

others require 12–14 months and a considerable proportion cannot be classified; the latter group includes trees bearing a mixture of early and late-maturing pods.
Testing of inbred lines of black wattle continued. One family was outstanding in combining good form and vigour with a relatively low incidence of gummosis. Crosses were made between inbred lines selected for high tannin content and low disease incidence. A number of Australian black wattles are being tested for frost resistance.

Progress reports and papers.

3739 *Moffett, A. A. & Nixon, K. M. Induced tetraploidy in black wattle* (Acacia mearnsii *de Wild.*). (*pp. 32–38*).
Colchicine-induced tetraploids had coarser, thicker leaves and larger flowers than the diploids and had reduced vigour. Many trees lacked apical dominance, producing much-branched crowns or, in extreme cases, large spreading bushes. Thickness of bark and tannin content were greater than in the diploids but it is considered that the lack of vigour would reduce tannin yields. The tetraploids were more susceptible to bagworm, *Kotochalia junodi*, than the diploids. There was little difference in fertility between diploids and tetraploids following self pollination. When open pollinated, however, the tetraploids set only half as many seeds per pod as the diploids.
Of 99 progeny plants from open-pollinated tetraploids in a mixed diploid and tetraploid plantation, 64 were tetraploid with 52 chromosomes. Accurate counts could not be made in 29 seedlings but they were approximately tetraploid. The 6 remaining plants had 38, 39, 50, 51, 53 and 54 chromosomes respectively. The occurrence of only one triploid and one aneuploid triploid suggests that the tetraploids are largely isolated as a breeding unit.

3740 Brückner, K.
Neue leistungsfähige Arzneipflanzensorten. (**New productive varieties of medicinal plants**).
Dtsch. Gartenbau 1960 : **7** : 178–80.
The polyploid peppermint, Polymentha, is described [cf. XXX, 2290]. Norma is an improved valerian which has a higher content of essential oil than Erfurter Breitblättriger [Erfurt Broad-leaved] and being vegetatively propagated is less variable; it also yields more roots.

3741 Kozłowski, J.
Kariotypy tataraku (*Acorus calamus* L.) na terenie Polski. [**Caryotypes of sweet flag (*A. calamus* L.) on Polish soil**].
Biul. Inst. Roślin Leczn. 1960 : **6** : 65–70.
Wild Polish material consisted of diploid ($2n = 24$) and triploid ($2n = 36$) forms, the oil content of rhizomes collected in July being 3·5–4·3% for the former and 5% or more for the latter.

3742 Martínez Vázquez, M.
Estudio cariológico de especies del género "*Anacyclus*". (**A caryological study of species of the genus *Anacyclus***).
Genet. iber. 1960 : **12** : 187–204.
A. pyrethrum, *A. radiatus*, *A. officinarum* and *A. officinalis* are reported to have $2n = 18$.

3743 Czabajska, W.
Hodowla wielkokwiatowej odmiany rumianku pospolitego (*Matricaria chamomilla* L). Część I. Poliploidyzacja rumianku. [**Breeding large-flowered common chamomile (*M. chamomilla* L). I. Polyploidization of chamomile**].
Biul. Inst. Roślin Leczn. 1960 : **6** : 71–82.
Compared with diploids, colchicine-induced tetraploids ($2n = 36$) had larger pollen grains, stomata and leaves, greater plant size, a broader capitulum, a higher 1000-grain weight and a greater number of glandular hairs on the ovaries of both ray and disc florets. A tetraploid gigas form with characteristic morphological features has been fixed but its large fruits are generally sterile. C_1 mutants with altered receptacle form and C_2 mutants in which the carpels of the tube florets are appreciably longer than in the controls have been found.

3744 Stroun, M., Ribeaupierre, R. de & Cortesi, R.
Hétérogénéité des tissus à la suite d'une fécondation pluripaternelle chez la belle-de-nuit (*Mirabilis jalapa* L.). (**Heterogeneity of the tissues following multipaternal fertilization in *M. jalapa***).
Ber. Schweiz. bot. Ges. 1960 : **70** : 50–61.
Crosses between different coloured varieties are discussed [cf. XXX, 3658]. The F_2 resulting from a bipaternal cross segregated into both male parent colours, the seed parent colour and some variegated types; in some cases, flowers of different types occurred on the same plant. No indications of polyploidy or other modification in chromosome number were observed in

individuals showing characters of both male parents. It is suggested that in multipaternal fertilization intraovular vegetative hybridization may occur by the assimilation of spermatozoids, this having some effect on the genome of the hybrid.

3745 **Annual Report of the Rubber Research Institute of Malaya, 1959** (1960) : Pp. 141.

A programme of hand pollination to secure a large family from RRIM501 x RRIM623 was initiated. Exploratory crosses involving these two clones and RRIM614, RRIM632 and LCB1320 were also effected. Selfing of RRIM501 continued the inbreeding programme. Further selections of clones derived from hand pollinations carried out since 1946 were made. On the estates, the number of pre-1942 trials was reduced to nine. Of the post-1946 trials, 42 were in tapping and 25 still immature.

3746 Baptiste, E. D. C.
Breeding for high yield and disease resistance in *Hevea*.
Quart. J. Rubb. Res. Inst. Ceylon 1960 : **36** : 38–51.

Progress in the selection and breeding of *Hevea* clones resistant to *Dothidella ulei* and *Phytophthora palmivora* in Brazil is reviewed and a list is given of those resistant clones which have been imported into Malaya and Ceylon since 1953–54. The list includes selections from *H. brasiliensis* and *H. pauciflora* but most of the resistant material has been derived from *H. benthamiana* 'F4542', a selection of upper Rio Negro origin. A report that *Dothidella* resistance has been broken in some Costa Rican material derived from F4542 is mentioned and stress is laid on the need to diversify genetic stocks.

The methods being used in Ceylon to combine the disease resistance of imported clones with the high yielding capacity of eastern (*H. brasiliensis*) clones from Ceylon are described. A discussion of the difficulties of testing for leaf-blight resistance in Ceylon, which is, so far, free of this disease, is followed by a reference to the possibility of setting up a testing centre at Turrialba in Costa Rica.

3747 Townsend, C. H. T. (Jun.).
Progress in developing superior *Hevea* clones in Brazil.
Econ. Bot. 1960 : **14** : 189–96.

An account is given of breeding at the Belterra Plantation to combine resistance to leaf blight (*Dothidella ulei*) with high yield and other characters. All resistant jungle selections have low yields, while all high-yielding clones introduced from the Far East are susceptible. From the large number of hybrid progenies so far tested, the following conclusions may be drawn. (1) Some resistant clones, when crossed with susceptible ones, transmit a high degree of resistance to a majority of their progenies. (2) Some resistant F_1 selections have proved to be more vigorous than either parent. (3) Most F_1 selections from crosses between resistant clones of *H. brasiliensis* and Eastern clones produce no resistant progenies, when back crossed or outcrossed with a high-yielding Eastern parent. (4) Some F_1 selections from crosses between resistant clones of *H. benthamiana* and Eastern clones, when back crossed or outcrossed with an Eastern parent, have given more than 50% resistant progenies. (5) Some first back crosses and outcrosses, with *H. benthamiana* and an Eastern clone as parents in the primary cross, when back crossed or outcrossed with a high yielding Eastern parent a second time, have given rise to families in which over 10% of the progenies are resistant. (6) A progressive loss in vigour occurs to a certain extent when back crossing or outcrossing to high-yielding Eastern clones is carried through the second and third generations. (7) A very small percentage of the F_1 selections has given promising yields. In addition, the performance of 43 derivatives from crosses of *H. pauciflora* and a high-yielding susceptible Eastern clone suggests that some selections of the former species are outstanding as transmitters of vigour and blight resistance to the majority of their progenies. Preliminary data on the few first-generation back crosses and outcrosses which have reached the stage of production indicate that average yields will be greater than those of the F_1 selections. It is considered that back crossing or outcrossing will have to be carried through the third generation before the characters of high yield and blight resistance can be satisfactorily combined. Even then, it may be necessary to double cross third generation lines to reintroduce vigour.

FRUITS AND NUTS

3748 Zur Selektion und Körung beim Obst. **(Selection and inspection of fruit).**
Diss. Landw. Hochsch. Hohenheim undated : Pp. 112.

The selection of fruit trees for the production of seed and grafting material is discussed and work carried out in Baden-Württemberg is described. The following were discovered: a

red-striped mutant, a completely red mutant and a large-fruited rough-skinned mutant of the apple Golden Pearmain; a smooth-skinned mutant of the apple Schöner aus Boskoop (= Belle de Boskoop); a russet mutant and a late-ripening form of the apple Frhr. v. Berlepsch; a frost-hardy pear seedling suitable as a root-stock; some late plums; two early large-fruited cherries resistant to transport; a bigarreau cherry resistant to splitting and a late dark-brown cherry with resistance to late frost.

3749 Guščin, M. Ju.
(The improvement of the assortment of fruit trees and soft fruits in the Ukrainian republic).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 41–47. [Russian].

[Cf. XXIX, 626].

3750 Rapport général 1959. Station de Recherches de l'État pour l'Amélioration des Plantes fruitières et maraîchères.
(General report 1959. State Experimental Station for the Improvement of Fruit and Market-garden Crops),
Gembloux : Pp. 98. (Mimeographed).

Pome fruits. Data are provided on the taste and appearance of 42 apple varieties and 45 pear varieties in 1958 and 1959.

Strawberry. The performance of hybrids produced between 1952 and 1959 is discussed. Observations on the percentage of streaked plants in each of 117 hybrid lines are reported. Varietal differences in time of flowering, number of flowers produced and yield were noted in trials conducted at Grand-Manil, Rongy and Gorsem. An investigation on the suitability of 15 lines for rapid freezing is reported; B26–6, Oranda and Talisman gave the best results.

Chicory. Thirty native and foreign wild lines are being tested for disease resistance and other economic characters.

Tomato. A large number of new hybrid lines have been developed and are undergoing further testing.

French bean. A total of 59 hybrid lines are being studied further.

Pea. Pedigree selection work and varietal trials are reported [cf. 991].

3751 Enikeev, H. K.
(The results of interspecific hybridization of fruit trees and soft fruits).
Agrobiologija (Agrobiology) 1959 : No. 6 : 924–28. [Russian].

This review of Soviet achievements in interspecific hybridization mentions the following results.

Apple. Winter-hardy hybrids with high yields were obtained by crossing *Malus prunifolia* and *M. baccata* with *M. domestica*. *M. prunifolia* has been produced synthetically by back-crossing *M. baccata* x *M. domestica* to *M. domestica*. A fertile hybrid of *M. domestica* x *Cydonia japonica* was bred at Jalta.

Pear. Varieties adapted to the Siberian climate have been obtained by crossing *Pyrus ussuriensis* with *P. communis*. Crosses between *P. serotina* and *P. communis* have been successful and fertile hybrids between pear and apple are reported from Mičurinsk and Jalta.

Apricot. Fertile hybrids of *Prunus salicina* x *P. armeniaca* have been produced; also a hybrid of *P. armeniaca* x *P. domestica* having 32 chromosomes. This last is partially fertile and is thought to be useful for production of late-flowering apricots.

Plum. Among fertile interspecific hybrids are mentioned those from crosses of *P. salicina*, *P. ussuriensis*, *P. americana* and *P. nigra* with *P. besseyi*. Hybrids of *P. cerasifera* x *P. salicina* have been obtained which are drought resistant and highly productive of large fruit of dessert quality. Hybrids between *P. spinosa* ($2n = 32$) and *P. domestica* ($2n = 48$) had 40 chromosomes. They are characterized by a low degree of fertility but their back crosses to *P. domestica* have given highly productive winter-hardy forms, some of these resembling large-fruited *P. spinosa*, others *P. insititia*.

Cherry. Fertile hybrids of *P. besseyi* with *P. tomentosa* and *P. cerasifera* have been produced; early bearing is a valuable character of these hybrids. Hybrids between sweet and sour cherries include some fertile triploids ($2n = 24$) which crop well when grafted on sour-cherry stocks.

Peach. High-yielding varieties have been obtained by crossing peach with almond and pollinating the resulting hybrid with a pollen mixture comprising different peach cultivars.

Gooseberry. Varieties with high yields and resistance to *Sphaerotheca* from crosses between *Ribes reclinatum* (*grossularia*) and *R. hirtellum* have been bred and introduced. Some fertile hybrids of *R. reclinatum* x *R. nigrum* have been produced.

Currant. Hybrids between *R. rubrum* and *R. nigrum* combining the characters of the parental species in different ways are reported. Some have 8 chromosomes, others 16, 24 or 32.

Strawberry. Fertile hybrids of *Fragaria grandiflora* ($2n = 56$) with *F. elatior* ($2n = 42$) and of the latter with *F. collina* ($2n = 14$) have been bred.

3752 Tamássy, I.
Új gyümölcs- es szőlőfajták megtartásának (fenntartásának) néhány elvi kérdése. (**Some theoretical questions on the maintenance of fruit and grape varieties**).
Növénytermelés 1960 : **9** : 269–76.

Observations on fruit trees and vines at the Horticultural College, Budapest, show that new hybrids and varieties take some time to become stable and that the following factors favour the occurrence of bud sports: propagation in the nursery at too early an age; use of lower branches of the crown, wild shoots, root suckers, or young nursery trees as scions; and grafting on strongly developing mature rootstocks. Cold resistance in fruit trees and *Plasmopara* resistance in vine increase with age, as does also productivity. Tables giving three years' data from 1957 to 1959 are presented, showing that the considerable *Plasmopara* resistance of *Vitis vinifera* x *V. amurensis* hybrids and their back crosses to either parental species increases with the age of the hybrid. Results indicating that chemical composition and grape colour improve with age are also presented. The undesirability of releasing a hybrid before it has become stabilized is stressed.

3753 Brooks, M. & Olmo, H. P.
Register of new fruit and nut varieties. List 15.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 725–58.

A further annotated list of varieties of fruits and nuts introduced by official and commercial agencies in North America is provided [cf. XXX, 3065].

3754 Bjurman, B.
Försök med djupfrysning av jordgubbar, hallon och körsbär. (**Experiments on deep freezing of strawberries, raspberries and cherries**).
Sverig. pomol. Foren. Årsskr. 1960 : 145–53.

The results of freezing tests are described, tables showing the scores for texture, flavour and appearance being given for those varieties with scores equal or superior to the average.

3755 Teoharova, R.
(**Soft fruit as a source of vitamin C**).
Ovoštarstvo (Fruit-growing) 1959 : **6** : No. 12 : 18–22 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 135 : p. 91. [Bulgarian]. (Mimeographed).

The vitamin C contents of varieties of black currant, strawberry, raspberry and blackberry are reported.

3756 Stoičkov, J., Colov, C. & Spahiev, D.
(**The amount of damage by late frost in the horticultural districts of the foot hills**).
Naučn. Trud. selskostopan. Akad. Georgi Dimitrov. Agron. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1960 : **8** : 261–78. [Bulgarian].

Four plums, one cherry and four peas showed good frost resistance in orchards in the Vrabevo area, Bulgaria.

3757 Campbell, R. W. & Hadle, F. B.
Winter injury to peaches and grapes.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 332–37.

Observations are reported on the injury suffered by 33 varieties of peach and 93 of grape as result of extremely low temperatures during the winter of 1958–59 at the Kansas Station Horticultural Farm.

3758 Hlopceva, I. M. & Vasil'ev, V. I.
(**Pome fruits on the northern spurs of Tien-shan**).
Sadovodstvo (Horticulture) 1960 : No. 9 : 25–26. [Russian].

High yielding winter-hardy varieties of apricot, plum and sweet and sour cherry which are adapted to the climate of the mountainous region of southeastern Kazahstan are listed. The apricots include Gajrat and other varieties which were selected from wild local forms. Special reference is made to the plum varieties Sliva Markova [Markov plum] and Kazahstan, both bred at Alma-Ata. They fruit early and have a high sugar content. Sliva Markova flowers late and in most years escapes spring frost.

3759 Nybom, N. & Bergendal, P.-O.
Växtförädlingen av äpple vid Balsgård—översikt över hittills vunna resultat och erfarenheter. (**Apple breeding at Balsgård—survey of results and experiences gained up to now**).
Sverig. pomol. Foren. Årsskr. 1960 : 63–89.

This general survey of the objectives and methods of breeding at Balsgård, Sweden, includes lists of the parents used in diploid x diploid, diploid x tetraploid, tetraploid x diploid and tetraploid x tetraploid crosses effected during 1946–59 and of the maternal varieties used in breeding for scab resistance. Further tables show the degrees of scab and

mildew resistance found in hybrid progenies of different parents. About 100 numbered varieties from 43 different crosses are now under observation, among which the most promising are: BM23433 (Transparente Blanche [White Transparent] x Rött Ananas [Red Pineapple]), which is earlier than the first parent; BM9966 (Gyllenkroks Astrakan x Worcester Pearmain), as early as BM23433 and apparently good in keeping quality; BM28379 and 28384 (Worcester Pearmain x Transparente Blanche), with attractive fruits of good quality, ripening at the end of August or beginning of September; BM6029 (open-pollinated Ingrid Marie), a promising variety which resembles James Grieve in form and quality but has bright red fruits, ripens earlier and bears regularly; BM24351 and 24353 (James Grieve x Worcester Pearmain), with fruits which are good in quality and colour and appear to keep well; BM31021 (Ingrid Marie x Filippa), with fruits of high quality, ripening in January–February; and BM34088 (Ingrid Marie x William Crump), whose fruits, which ripen in January, have dark-red skins and firm white flesh with a fine aroma.

3760 Schaap, A. A.
Het I.V.T. kweekt nieuwe appelrassen. (**The Institute of Horticultural Plant Breeding breeds new apple varieties**).
Fruitteelt 1960 : 1428–31.

This popular article on breeding objectives and the techniques used in crossing, raising and selecting new varieties in the Netherlands includes a list of 12 varieties and the characters they transmit to their progeny. Crosses between such early varieties as Yellow Transparent and Perzikrode Zomerappel [Peach-red Summer apple] have yielded material poor in quality; the early varieties have therefore been crossed with later ones of better quality. James Grieve x Irish Peach and Golden Delicious x Ingrid Marie have given seedlings with apples good in flavour, colour and keeping quality. A seedling from Cox's Orange Pippin x Golden Delicious resembles the latter parent in appearance and keeping quality but has the flavour of the former.

3761 Brown, A. G.
The inheritance of shape, size and season of ripening in progenies of the cultivated apple.
Euphytica, Wageningen 1960 : **9** : 327–37.

Analysis of data from 1387 seedlings pertaining to 44 progenies derived from 21 crosses between diploid varieties showed that the above characters were all quantitatively inherited. The progeny mean for fruit shape rating (based on the ratio length/diameter) was approximately the same as the midparental value. For fruit size (length x radius^2/1000), the progeny mean was generally less than the midparental value, being on the average about 34% smaller. The progeny mean for season of ripening was also close to the midparental value, except in crosses between late-maturing varieties, in which case the progeny mean was earlier than the midparent. By treating the data as an incomplete diallel cross, it was shown that the calculated main effects of each of the 21 parents allow predictions regarding the progeny means for each of the three characters to be made for untested combinations of parents.
Results from small inbred progenies were similar for all three characters to those obtained from the outbred progenies.

3762 Breviglieri, N.
Il melo Delicious e le sue mutazioni gemmarie. (**The Delicious apple and its bud mutations**).
Ital. agric. 1960 : **97** : 1179–208.

Statistics are presented showing the amounts of the different apple cultivars grown in Italy, where the Delicious group is third in popularity, and in the USA and Canada. The history of the Delicious apple and of its various sports is outlined. One of these, Starkrimson, is considered specially interesting on account of its small stature, vigour, frost resistance and early coloration of the fruit; it is described. Experiments have shown that Stark Delicious provides an effective pollinator.
Some hybrids of Delicious are also enumerated.

3763 (**The apple Aport at Alma-Ata**).
Sadovodstvo (Horticulture) 1960 : No. 10 : p. 40. [Russian].

The above variety was introduced into Kazahstan from Voronež province. It is highly productive, winter hardy and resistant to scab. The fruit is large and its flavour good.

3764 Ostrouhova, S. A.
(**Local Turkmenian apples**).
Sadovodstvo (Horticulture) 1960 : No. 6 : 27–30. [Russian].

Two local races, one from the Babaarab and the other from the Hazarasp district, each comprising several variants, are described. They are valued for their tolerance of salinity, high temperatures and waterlogging, also as rootstocks for a number of varieties. The

Hazarasp form is more winter hardy than the other.

3765 Nesterov, Ja. S.
(Keeping quality of fruit of the best apple varieties in the southern zone).
Sadovodstvo (Horticulture) 1960 : No. 10 : 33–34. [Russian].
Tabulated information on loss in weight during storage is provided for 31 varieties, differing in date of maturity.

3766 Vasil'čenko, G. V.
(Selected forms of Siberian apple as rootstocks).
Sadovodstvo (Horticulture) 1960 : No. 6 : 18–21. [Russian].
Descriptions are given of three cultivated forms of Siberian apple which have been selected for use as rootstocks at the Altaj Horticultural Research Station. They give a more uniform seed progeny than Renetka Purpurnaja [Purple Reinette] and are superior to it in winter hardiness and resistance to *Venturia*.

3767 Dolgov, V. F.
(Biological characteristics of new dwarfing and semidwarfing rootstocks).
Agrobiologija (Agrobiology) 1959 : No. 6 : 938–39. [Russian].
The new apple rootstocks Krasnolistnaja Paradizka [Red-leafed Paradise] (Paradise VIII x Krasnyj Štandard [Red Standard]), a dwarfing kind, and the semidwarfing Hybrid 13–14 (Paradise VIII x Taežnoe [Tajga]) proved superior in rooting capacity to the common stocks such as Paradise IX at Mičurinsk. Both are very winter hardy.

3768 Johansson, E. & Sahlström, H.
Sortförsök med äpple i Norrland och Värmland. **(Varietal trials of apple in Norrland and Värmland).**
Sverig. pomol. Foren. Årsskr. 1960 : 115–31.
Of 12 varieties, the following appear to be suitable for such areas as the above, where winter hardiness is required: Hornö (a local variety), Lobo, Melba, Suislepper (and, in slightly more favourable districts, Cloetta and Transparente Blanche [White Transparent]. Two new clones, one from Antonovka x Ecklinville and the other from open-pollinated Wealthy, have shown promise.

3769 Blasse, W.
Beobachtungen über die Trockenresistenz von Äpfeln auf verschiedenen Unterlagen im Sommer 1959. **(Observations on the drought resistance of apples on different rootstocks in summer 1959).**
Arch. Gartenb. 1960 : **8** : 441–52.
Of the five varieties tested, Ontario was most resistant to drought and Goldparmäne [Golden Pearmain] came second in this respect. The rootstocks differed in their effect on the resistance of the varieties but the varietal character predominated over the influence of the rootstock.

3770 Štundjuk, A. V.
(Damage to fruit by the larvae of *Pyrausta nubilalis*).
Sadovodstvo (Horticulture) 1960 : No. 6 : p. 61. [Russian].
Extensive damage to different apple and plum varieties was observed at Habarovsk in 1959. In apples, the amount of damage depended on variety, with Triumf [Triumph], Avangard [Avant-garde] and Dal'nevostočnoe Rannee [Far-eastern Early] escaping attack altogether.

3771 Faccioli, F.
Contributo allo studio della cultivar di pero "S. Lazzaro precoce". **(Contribution to the study of the pear cultivar S. Lazzaro precoce).**
Riv. Ortoflorofruttic. ital. 1960 : **44** : 425–35.
The cultivar described is a local pear of unknown origin, commonly grown in the Vignola zone of northern Italy. It is self incompatible but flowers at the same time as Williams, which is a good pollinator for it. Its fruit ripens at the same time as Coscia precoce [Early Coscia] and before Beurré Giffard and Williams but is less prone to rotting than these varieties.

3772 Vysockij, A. A.
(Pears from Trubčevsk).
Sadovodstvo (Horticulture) 1960 : No. 9 : 35–36. [Russian].
Four local varieties from the Trubčevsk district in the province of Brjansk are described. All are highly productive, winter hardy and resistant to diseases and have sweet fruit. They ripen in July, August, September or October.

3773 Mišić, P. D.
Proučavanje bioloških i citogenetičkih odlika domaćih sorti krušaka. II Deo. Proučavanje cvetanja, odnosa oplodjavanja, partenokarpije i klijavosti semena. (**Studies on the biological and cytogenetical characteristics of indigenous pear varieties. II. Studies on flowering, degree of fertilization, parthenocarpy and seed germination**).
Arh. poljopr. Nauk. 1960 : **13** : No. 39 : 54–70.

Of 24 varieties studied, only 4 were partially self fertile; these were Gnjilica [pear from Gnjilane], Krupna Letnja Muškatka [Large Summer Muscat], Pšenička and Šećerasta Banatska [Banat Sugary]. No universal pollinators were found but seven diploid varieties were rated satisfactory. Pollen grains of the triploid variety Dimničarka could be used to stimulate parthenocarpic development in Lubeničarka and Turšijača. [Cf. XXX, 1130].

3774 Cizov, S. T.
(The winter hardiness of hybrid seedlings of Lukašov's pear varieties).
Izv. timirjazev. sel'skohozjajstv. Akad. (News Timirjaazv agric. Acad.) 1960 : No. 5 : 202–05. [Russian].

Tëma, Polja, Olja and Lida, which were bred some years ago by Lukašov, were outstandingly winter hardy in the province of Moscow in the severe winter of 1955–56 and are recommended as breeding material and for introduction in this province and north of it. Observations at the Horticultural Station and the Otradnoe Farm of the Timirjazev Agricultural Academy showed that a high percentage of open-pollinated seedlings of these varieties had no or only slight frost injury. Some winter-hardy hybrids were also obtained from the crosses of Tëma and Olja with central Russian or west European cultivars. Various seedlings grafted on Lukašov's varieties proved as hardy as those on *Pyrus sylvestris* and hardier than on stocks of central Russian varieties. The seedlings of Polja and Olja and of *P. sylvestris* were the hardiest in these experiments.

3775 Rudkovskij, G. P.
(Kiev quinces).
Priroda (Nature), Leningrad 1960 : No. 12 : p. 115. [Russian].

Descriptions are given of four winter-hardy seedlings raised from unspecified varieties at Kiev. They are all highly productive of large attractive fruits having tender, juicy and aromatic flesh and make jam of fine quality.

3776 Ljubič, F. P.
(Bud mutations in apricot).
Sadovodstvo (Horticulture) 1960 : No. 6 : p. 58. [Russian].

Several instances of sports are reported from the Astrahan' province. One of these arose on a seedling which coalesced at the base with another seedling differing in leaf shape, size and colour and the flavour and maturation of fruit. It resembled the neighbour in all respects except fruit size and maturation.

3777 Komitov, R.
(The Drjanovo late apricot).
Ovoštarstvo (Fruit-growing) 1959 : **6** : No. 10 : 10–11 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. **131** : p. 89. [Bulgarian]. (Mimeographed).

This very productive variety has large fruit with an average weight of 46 g. and good quality. The fruits may be used fresh or processed; they tend to split if there is much rain during June and July.

3778 Barak, D.
(The apricot in Israel).
Sadeh (Field)/Hassadeh 1961 : **41** : 533–37; 695–97. [Hebrew].

Six local and three introduced varieties are described.

3779 **(The apricot variety Šalah).**
Sadovodstvo (Horticulture) 1960 : No. 6 : p. 34. [Russian].

Šalah is a local Armenian variety with high regular yields of large fruit having a pleasant sweet flavour. It is self sterile.

3780 Plock, H.
Ungarische Beste syn. Klosterneuburger Marille.
Mitt. Klosterneuburg : Ser. B 1960 : **10** : 22–24.

Ungarische Beste [Hungarian Best], also known as Klosterneuburger Marille [Klosterneuburg apricot], has been found to have many different forms varying in morphological characters, growth and time of ripening. Nine types differing in characters of the stone are illustrated.

3781 Fărtunova, T.
(At the Trojan provincial horticultural station).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 10 : 24–25. [Bulgarian].

Mention is made of plum hybrids obtained by crossing Kjustendilska Sinja [Blue Kjustendil]

with Montfort and other varieties at the above institute. The hybrids have large fruit differing in shape and colour from Kjustendilska Sinja and have so far shown resistance to disease, in particular to *Polystigma rubrum*.

3782 Koserkov, A.
(An investigation on the plum varieties in south-east Dobrudža).
Nauč. Trud. dobrudž. selskostop. nauč.-izsled. Inst. (Sci. Proc. Dobrudža agric. sci.-res. Inst.) 1959 : **3** : No. 1 : 121–49 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 132 : p. 89. [Bulgarian]. (Mimeographed).
Plum trees growing in this region showed considerable frost resistance, the flowering and ripening of the fruit being rather late. A pomological description of 34 varieties has been prepared and varieties are recommended for growing in Dobrudža.

3783 Černyšov, M. V.
(The plum from Sahalin).
Sadovodstvo (Horticulture) 1960 : No. 6 : p. 60. [Russian].
The local variety found in South Sahalin is probably a selection of *Prunus ussuriensis*. It is winter hardy, moderate in climatic and soil requirements and an annual cropper. It is regarded as valuable material for breeding winter-hardy forms with low, spreading habit.

3784 Werneck, H. L. & Bertsch, K.
Zur Ur- und Frühgeschichte der Pflaumen im oberen Rhein- und Donauraume.
(On the prehistory and early history of plums in the upper Rhine and Danube region).
Angew. Bot. 1959 : **33** : 19–33.
On the basis of the form of the stone, it is shown that a continuous series of forms exists between the plums and damsons (*Prunus domestica*) occurring in prehistoric, Roman and later finds in the above area and those of modern primitive races occurring in Austria which are grown from seed or root cuttings and without grafting [cf. XXVIII, 4636]. It is concluded that these forms are indigenous. It is believed that *P. cerasifera* and *P. spinosa*, the parents of *P. domestica*, occurred together during a warm climatic period and spontaneously gave rise to the hybrid which later, in the Neolithic Age, was cultivated without the aid of grafting. In this connexion, some present-day forms which are morphologically close to *P. cerasifera* are mentioned.

3785 Teterev, F. K. & Mel'nikova, K. D.
(The problems of pollination and fruiting in plums).
Agrobiologija (Agrobiology) 1959 : No. 6 : 867–73. [Russian].
Plums studied at Majkop comprised self-sterile varieties and varieties with different degrees of self fertility. Among the latter some produced twice the number of fruit on pollination with pollen from other trees of the same variety than when they were open pollinated or fertilized by self pollen from the same tree. Most myrobalans and sloes were self sterile; others gave very low percentages of sets from selfing. Pollen viability in plums and myrobalans varied from 78·7% to 99·2%, depending on variety. Varietal differences in pollen viability were confirmed by culturing pollen in a sugar solution. The fertilization of some plum varieties by selected pollinators or pollen mixtures improved the fruit set in comparison with open pollination. The pollen of some varieties had the effect of increasing the size of the fruit, besides improving fruit yield.

Proceedings of the Fifty-sixth Annual Meeting of the Washington State Horticulture Association, Yakima, December 5, 6, 7, 1960 : Pp. 292.

3786 *Fogle, H. W. A sweet cherry improvement program for the Pacific Northwest.* (*pp. 141–44*).
Variety testing, breeding and other work on sweet cherry at the Irrigation Experiment Station, Prosser, Wash., is reviewed. Chinook and Rainier were released in 1960. [Cf. 2528].

3787 Aberkiev, N. T.
(Sour cherry in the Urals).
Sadovodstvo (Horticulture) 1960 : No. 7 : p. 25. [Russian].
Varieties of *Prunus fruticosa* selected from wild local material in the Sverdlovsk province are listed. They are early and highly productive of fruit suitable for processing.

3788 **(The sour-cherry variety Amorel' Rozovaja).**
Sadovodstvo (Horticulture) 1960 : No. 7 : p. 38. [Russian].
Amorel' Rozovaja [Pink Morello], which is found in the Povolž'e, is highly self fertile, winter hardy and productive of large fruit having a pleasant flavour.

3789 Kravčenko, E. P.
(New sweet cherry varieties for southern Poles'e in the Ukraine).
Sadovodstvo (Horticulture) 1960 : No. 7 : 21–23. [Russian].
Recent sweet cherry varieties bred in the Ukraine, in particular Kiev 2, Kiev 5 and hybrids 25K and 26K, combined high yield with good flavour in trials at Kiev. All the above varieties are midseason types. Hybrid 25K has pink fruit while all the others have dark fruit.

3790 Bolbačan, I. I.
(The sour-cherry variety Bolbačanka).
Sadovodstvo (Horticulture) 1960 : No. 7 : p. 37. [Russian].
Bolbačanka [Bolbačan's] (Ljubskaja x Krasa Severa [Northern Beauty]) was bred in Kirgizia. It is winter hardy and crops annually. It has large red fruit rich in sugar, and ripens in July. It is eaten fresh or processed.

3791 Tuz, A. S.
(Glabrous peaches).
Priroda (Nature), Leningrad 1960 : No. 12 : 114–15. [Russian].
A self-sterile seedling of *Prunus ferganensis* having glabrous fruit from the Fergana Branch of the Šreder Institute is described. It is thought to have arisen by interspecific hybridization with nectarine. In experimental crosses to test this, 10% of the fruits set. It is believed that nectarines which may be obtained in this way would be resistant to *Sphaerotheca*.

3792 **(The peach variety Kremlevskij).**
Sadovodstvo (Horticulture) 1960 : No. 6 : 34–35. [Russian].
Kremlevskij [Kremlin] (Rochester x Elberta) was bred at Jalta. It has large fruit of dessert quality and yields up to 29 kg. per tree. It is resistant to drought and moderately resistant to frost. It is self sterile.

3793 **Early peach variety.**
Amer. Fruit Gr. 1960 : **80** : No. 11 : p. 22.
The release of the very early-ripening peach Earlired by the US Department of Agriculture is announced. Yellow-fleshed, it is a clingstone when firmly ripe and a semiclingstone at the soft-ripe stage. The fruit develops a prominent point and suture when grown as far south as the central parts of Georgia, Alabama and Texas, but its shape farther north has been satisfactory.

3794 Aliev, G. G. & Gadžiev, T. Ju.
(Peach varieties resistant to leaf curl).
Sadovodstvo (Horticulture) 1960 : No. 10 : 30–33. [Russian].
Details are given of growth period, productiveness and resistance to *Taphrina* for a series of varieties tested in Azerbaijan. Brief descriptions are given of Zafrani Pozdnij [Late Zafrani], Ag-Nazly, Kyrmyzy-Jarma, Cumberland and Ag-Kerdi, all of which produce high-quality fruit, besides being highly productive and resistant or immune to *Taphrina*.

3795 Zorin, F. M.
(Pollination and surgery in the breeding of citrus fruits).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 9 : 133–37. [Russian].
Vegetative and sexual hybridization of citrus fruits is discussed and new improved graft-hybridization techniques developed at the Soči and Suhumi research stations are described. Mention is made of graft hybrids and vegetative-sexual hybrids from both research institutes which give segregates intermediate between the graft components in their sexual progeny. Hybrids of this kind also occur among the nucellar seedlings of graft hybrids.

3796 Krishnamurthy, S., Ranjit Singh & Deo, P. V.
Identification of citrus species by colorimetric tests.
Indian J. Hort. 1960 : **17** : 107–11.
Eight species of *Citrus*, *Fortunella japonica* and three interspecific-hybrid varieties (Rangpur lime, Sunshine tangelo and Meyer lemon) were all distinguishable by the colour reactions of their bark extracts, the Almen and ammonium molybdate tests being more useful in identification than the ferric chloride test. The three interspecific hybrids did not show any resemblances in colour reactions to their parent species. From the colorimetric tests, it is concluded that *C. jambhiri* should be regarded as a distinct species from *C. limon*, *C. limettoides* as distinct from *C. aurantifolia*, and *C. paradisi* as distinct from *C. grandis*.

3797 Nijjar, G. D.
Quantitative tests for measuring cold hardiness of citrus seedlings.
Indian J. Hort. 1960 : **17** : 112–21.
In investigations at the University of Florida, Gainesville, a freezing test proved to be a more reliable method of evaluating hardiness than

electrical-conductivity tests of tissue extract and intact tissue, estimation of water-soluble proteins and the plasmolysis technique. The material tested consisted of seedlings of *C. aurantifolia*, *C. limon* and *C. aurantium*. It is hoped that the freezing test may prove useful in breeding and other work. The seedlings were exposed to 23° F. for 3 hr., allowed to thaw at 35° F. and then placed in a growth chamber at 78° F. for 3 weeks. The seedlings may be prehardened by alternating high day and low night temperatures for at least 10 days.

3798 Džanilidze, V. S. & Razmadze, E. G.
(The first results of state varietal trials with lemons).
Sadovodstvo (Horticulture) 1960 : No. 10 : 27–30. [Russian].
Meyer's lemon was the most resistant to frost and *Deuterophoma* among varieties tested in Georgia, while Novo-Gruzinskij [New Georgian], Udarnik [Shock-worker], Villa Franca and Genoa were the most productive when grown free from infection in a sheltered position.

3799 Edward, J. C.
Variation in the guava wilt pathogen, *Fusarium oxysporum* f. *psidii*.
Indian Phytopath. 1960 : **13** : 30–36.
Isolates of the above fungus varied in pathogenicity and other characters.

3800 Roy, R. S. & Sharma, C.
Mutation in mango (*Mangifera indica* L.).
Indian J. Hort. 1960 : **17** : 142–43.
A bud sport discovered in the local variety Hirasonia at the Bihar Agricultural College, Sabour, bore virtually fibreless fruits, larger than those of the parent variety and differing in other respects. The mutant is considered to be of potential economic value.

3801 **(The persimmon Hiakume).**
Sadovodstvo (Horticulture) 1960 : No. 10 : p. 41. [Russian].
The above Caucasian variety is tolerant of frost and has large fruits rich in sugar and vitamins. The keeping quality is good and it is eaten fresh or dried.

3802 De Rosa, M.
La "Riccia di Talanico" nocciuola di elevata resa. **(Riccia di Talanico, a hazel with high kernel yield).**
G. Agric. 1961 : **71** : p. 95.
The variety described is thought to be of hybrid origin; it flowers early and copiously; its fruits mature early, in late August or early September, and are distinguished by a high kernel percentage and outstanding quality and flavour, for which reason they command a higher price than those of other well known Italian cultivars such as Mortarella. The variety is resistant to *Cytospora corylicola* and responds well to improvements in soil fertility.

3803 Bonifacio, G.
In decadenza il mandorlo. **(The almond in decay).**
G. Agric. 1961 : **71** : p. 3.
Means of restoring the quality of the almond groves in southern Italy are suggested. One of these is to restrict production to a limited number of varieties, if necessary by cutting down old trees and regrafting. Some of the most suitable varieties, characterized by late flowering, vigour, high yield and good quality, are mentioned.

3804 Milella, A.
Le principali cultivar di mandorlo della Sardegna. **(The main almond cultivars of Sardinia).**
Stud. sassaresi : Sez. III 1959 : **7** : 3–18.
Twenty local cultivars have been identified in the Cagliari province. Of these, 6 are deemed unsuitable for further cultivation and the remaining 14 are described. Five are singled out as having special merits, some for particular areas, some for wide range of adaptation and some as pollinators. Cossu is mentioned on account of its late flowering.

3805 Thongpradit(th), W.
(Rambutan orchards in Naradhivas).
Kasikor (Farmer)/Kasikorn, Bangkok 1955 : **28** : 425–33. [Siamese].
Descriptive and cultural notes are given for five rambutan varieties widely grown in Naradhivas and neighbouring provinces in Siam.

3806 Kravčenko, E. I.
(Fruiting of the pistachio and ways of improving the quality of its nuts).
Vestn. sel'skozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 125–29. [Russian].
Differences in fruiting habit and nut quality of wild *Pistacia vera* forms in Turkmenia are discussed. Forms with large nuts having dehiscent shells on maturing had a higher kernel : shell ratio than forms with indehiscent nuts of equal size. The former are recommended as material for breeding.

3807 TER HORST, K. & MASTENBROEK, J. J.
De selectie van peulvruchten in Suriname. II. *Arachis hypogaea* L., pinda. (**The selection of pulses in Surinam. II. *A. hypogaea* L., groundnut**).
Surinaam. Landb. 1960 : **8** : 134–50.

Breeding methods used at present are line selection in local and introduced varieties and the selection of mutants induced by ionizing radiation. Fifty-five varieties are undergoing selection. Of the tested selections, Matjan [Tiger], Schwarz 21/LP504 and Schwarz 21/LP5012 yielded most. Matjan is a Spanish type with well formed, two-seeded pods, good seed set, resistance to *Pseudomonas* and short branches making the plant compact; the seeds are not as large as desired and they lack a dormancy period, and the resistance to *Cercospora* is only moderate.

3808 D'CRUZ, R. & CHAKRAVARTI, K.
A case of asynapsis in Arachis allopolyploid.
Poona agric. Coll. Mag. 1960 : **51** : No. 2 : 15–17.

Apart from one plant, allopolyploids ($2n = 60$) of *A. hypogaea* x *A. villosa* had an average configuration of $2{\cdot}00_{IV} + 25{\cdot}91_{II} + 0{\cdot}18_{I}$. In the exceptional allopolyploid, the average configuration was $0{\cdot}60_{IV} + 0{\cdot}30_{III} + 23{\cdot}85_{II} + 9{\cdot}00_{I}$; possibly a gene for asynapsis was present.

3809 GAIKWAD, V. J., KULKARNI, Y. S. & GHARE, M. M.
Faizpur 1–5, a new groundnut variety.
Poona agric. Coll. Mag. 1960 : **51** : No. 2 : 29–32.

Faizpur 1–5, selected from a local collection and to be released in East Khandesh, shows considerable improvements over Spanish Local in pod, kernel and oil yields.

3810 **New strain of groundnut.**
Arecanut J. 1960 : **11** : p. 70.

Karad 4–11, a strain with spreading habit, outyielded local varieties by 26·7% in the Kalhapur district of Bombay. Shelling outturn was 1·9% higher and oil content 3·4% higher than in the local varieties.

3811 RIGONI, V. A. & PIETRARELLI, J. R.
Manfredi Champaquí, nueva variedad de maní para Córdoba. (**Manfredi Champaquí, a new groundnut variety for Córdoba**).
Publ. téc. Estac. exp. Agropec. Manfredi 1960 : No. 16 : Unpaginated.

Derived from a cross between Negro 4 [Black 4] and Fla. 249–40–B3, Manfredi Champaquí has shown high resistance to *Cercospora* spp. and to virus diseases. The pods are three or four grained, the fat content varying between 47 and 49%. In yield trials conducted at Manfredi and Rio Tercero, the new variety outyielded Blanco Manfredi [White Manfredi] and two other commercial varieties.

3812 COPPER, W. E.
Strains of, resistance to, and antagonists of *Sclerotium rolfsii*.
Phytopathology 1961 : **51** : 113–16.

Literature on strains of *S.* (*Pellicularia*) *rolfsii* and varietal resistance in the groundnut and other crops is summarized.

3813 MURTHY, K. N. & BAVAPPA, K. V. A.
Breeding in arecanut.
Arecanut. J. 1960 : **11** : 60–61.

Controlled pollination experiments indicated that flower shedding in *Areca catechu* is not due to failure of pollination and fertilization. Physiological and environmental factors are thought to be responsible.

3814 MURTHY, K. N. & BAVAPPA, K. V. A.
Floral biology of areca (*Areca catechu* Linn.).
Arecanut J. 1960 : **11** : 51–55.

Flower morphology and development is described. While the male and female flowering phases are usually separated by a few days, some overlapping occurs; while cross pollination is the general rule, some selfing takes place. The stigma remains receptive for up to 6 days with maximum receptivity between the second and fourth day after flower opening.

3815 **Annual Report of the Coconut Research Institute for 1959.**
Ceylon Cocon. Quart. 1959 : **10** : Pp. 74.

The oil content, moisture content and copra yield and quality of 15 Ceylonese varieties and forms are reported. Information is given on the performance of nine-year-old *typica* x *nana* progenies. An extensive *typica* x *typica* crossing programme was carried out at seven stations, using selected palms as the female parents and a "prepotent" palm as the male parent.

3816 LUANGSAMANWANAKICH
(Selection of coconut for seeds).
Kasikor (Farmer)/Kasikorn, Bangkok 1954 : **27** : 419–26. [Siamese].

Criteria for the selection of mother plants are discussed.

3817 Nambiar, M. C. & Upadhya, M. D.
Prestaining treatment and squashing for somatic chromosomes of the coconut palm.
Stain Tech. 1961 : **36** : p. 31.
A technique for the preparation of somatic cells of *Cocos nucifera* for cytological study is described. The most suitable material for the prestaining treatment was 8-oxyquinoline [cf. XXVI, 79].

3818 Manthiriratne, M. A. P. P. & Liyanage, D. V.
Method of artificial pollination of coconut palms.
Ceylon Coconut Planters' Rev. 1960 : **1** : No. 2 : 1–10.
Detailed information is provided on the selection and preparation of coconut palms for pollination, the collection and storage of pollen, and an improved method of controlled pollination.

3819 Nambiar, M. C. & Swaminathan, M. S.
Chromosome morphology, microsporogenesis and pollen fertility in some varieties of coconut.
Indian J. Genet. 1960 : **20** : 200–11.
At the Indian Agricultural Research Institute, New Delhi, studies were carried out on *Cocos nucifera* 'Dwarf Red', 'Apricot' (a semitall variety) and a tall variety from the Laccadive Islands. Chromosome morphology was studied in the tall variety and an idiogram is presented. The pollen-sterility values obtained were 30% in Apricot and Dwarf Red and 5% in the Laccadive variety. Meiosis was regular in the last variety but a number of abnormalities were noted in Apricot and Dwarf Red; Apricot had a higher frequency of aberrant cells than Dwarf Red. It is suggested that dwarf palms may have arisen from the normal (tall) types as a result of inbreeding following the imposition of a self-pollinating device; the semitall varieties could then be regarded as early-generation inbreds. The possibility of exploiting hybrid vigour in dwarf x dwarf crosses is discussed.

3820 Tomaselli, R.
Differenziazione delle gemme in alcune cultivar di olive nell'Ascolano. (**Differentiation of the buds in certain olive cultivars of the Ascoli area**).
Atti. Ist. bot. Univ. Pavia : Ser. 5 : 1960 : **28** : 108–23.
The famous olives of Ascoli Piceno exist in three forms, the hard, medium-hard and tender, the most popular being Ascolana tenera [Ascoli Tender], which is described, together with three other cultivars commonly grown in the region. Separate descriptions are given of the differentiating buds and of the germination of the pollen. In Ascolana tenera the buds differentiated earlier than in Carboncella, the earliest differentiation of all being in Lea. Lea being the best pollinator for Ascolana, the relatively late differentiation of the latter may be one of the causes of the reductions in its set of fruit that have been observed recently.

3821 (**The pomegranate Gjuloša Azerbajdžanskaja**).
Sadovodstvo (Horticulture) 1960 : No. 10 : p. 41. [Russian].
Gjuloša Azerbajdžanskaja [Azerbaijan Gjuloša] is tolerant of drought and a temperature of — 15° C. and has large sweet fruit which is eaten fresh or used for preparation of juice. It transports well and keeps for 2–3 months.

3822 Phrayaphathyaphongsa
(**Durian**).
Kasikor (Farmer)/Kasikorn, Bangkok 1954 : **27** : 131–37. [Siamese].
It is considered that the durian was probably introduced into Siam from Malaya. The evolution of the different varieties is discussed and Kopmaitao is recommended as the best of the Siamese stocks.

3823 Phrayaphathyaphongsa
[**The history of durian (*Durio zibethinus*)**].
Kasikor (Farmer)/Kasikorn, Bangkok 1955 : **28** : 19–27. [Siamese].
Three varieties recommended for the Chantaburi region of Thailand are Khanyon, Kopmaitao and Enug.

3824 Haskell, G. & Tun, N. N.
Developmental sequence of chromosome number in a cytologically unstable Rubus hybrid.
Genet. Res. 1961 : **2** : 10–24.
Serial cytological observations were made on one very stunted seedling among the thornless segregates in an F_2 from *R. craniensis* 'Merton Thornless' ($2n = 28$) x *R. procerus* 'Himalaya Giant' ($2n = 28$). Chromosome numbers were determined at intervals over a period of 168 days, beginning when the plant was 7 months old. The number in the root tips varied from 9 to 46 per cell, with the mode invariably at 35. The wide variation in number decreased with time, until there was almost stability at $2n = 35$. A count of $2n = 39$ was obtained from a stipule cell. Reduction in chromosome number

was not the result of terminal fusion, as indicated by observations on chromosome size. Evidence from numbers of satellites per cell suggested that the same chromosomes were not necessarily undergoing elimination. Chromosome numbers and the corresponding cell sizes were correlated within the aneuploid series. This association may be connected with the incremental change in amount of DNA, following addition or elimination of individual chromosomes, which are alike in size in *Rubus*. The cause of the instability was not definitely established. Its initiation is, however, probably attributable to the egg mother cell. No evidence was obtained that the instability was caused by mitotic abnormalities or virus infection. The instability in this plant is discussed in relation to other examples in *Rubus* and other genera. It is suggested that the changes in chromosome number known to have occurred in some cultivated forms of *Rubus* may have arisen somatically.

3825 **(The raspberry variety Soviet).**
Sadovodstvo (Horticulture) 1960 : No. 6 p. 35. [Russian].
Soviet was bred in Estonia. It yields 1·3–1·5 kg. per plant and has large, sweet and juicy berries with a sugar content of 5·35%.

3826 KHLAYASUTAR, W.
(The banana variety Klueyhomthong).
Kasikor (Farmer)/Kasikorn, Bangkok 1953 : **26** : 301–06. [Siamese].
Detailed descriptions are given of the best of the Siamese banana varieties, including Klueyhomthong, a commonly grown variety.

3827 TAMÁS, P.
Untersuchungen zur Charakterisierung der Winterresistenz der Schwarzen und Roten Johannisbeere. **(Investigations on characterizing the winter resistance of black and red currants).**
Züchter 1960 : **30** : 242–47.
Details are given of a method of determining frost resistance; this involves measuring the electrolytic resistance of diffusates from buds and shoots which have been subjected to low temperatures. The method avoids errors which occur with other procedures and is recommended for use in selection work. Winter hardiness was found to depend on a combination of specific frost resistance and slow development in the leafless stage. In general red currants developed more slowly than black.

3828 POTAPKOVA, L. A.
(The black-currant variety Pamjat' Mičurina).
Sadovodstvo (Horticulture) 1960 : No. 6 : p. 61. [Russian].
Pamjat' Mičurina [Mičurin Memorial] was more winter-hardy, early and productive than all other varieties tested at Vladimir.

3829 **(The black currant Stahanovka Altaja).**
Sadovodstvo (Horticulture) 1960 : No. 6 : p. 35. [Russian].
Stahanovka Altaja [Altaj Stahanovist] (Goliath x Primorskij Čempion [Primor'e Champion]) was bred at Barnaul. It is characterized by self fertility and late, uniform maturation. The average yield is 4·4 kg. per plant, each berry weighing 0·6 to 0·7 g. The flavour is good and transportability and frost resistance are fair.

3830 BRIGHTWELL, W. T. & WOODWARD, O. J.
Blueberry breeding in Georgia.
Fruit Var. hort. Dig. 1960 : **15** : p. 39.
Breeding initiated at the Georgia Coastal Plain Experiment Station, Tifton, in 1940 is briefly described. To date, 94 seedlings have been chosen for further study. These comprise 68 from intervarietal crosses of rabbit eye blueberry (*Vaccinium ashei*), 4 from rabbit eye x *V. constablaei*, 4 from rabbit eye x high bush, 6 from high-bush x Florida Evergreen (*V. myrsinites*) and 11 from high bush x high bush. Considerable progress has been made in improving fruit size and colour and in reducing seed size and length of ripening period.

3831 **T–1 blueberry for South.**
Amer. Fruit Gr. 1960 : **80** : No. 11 : p. 22.
A new rabbit eye blueberry, temporarily designated T–1, has been developed from Ethel x Callaway at the Georgia Coastal Plain Experiment Station, Tifton. Bearing fruits rather flat in shape and with a diameter of $\frac{1}{2}$–$\frac{3}{4}$ in., T–1 ripens about ten days earlier than other rabbit eye varieties grown in Georgia and is comparable with northern high bush blueberries in fruit colour and productiveness.

3832 KORNEJČIK, Ž. N.
(Promising strawberry varieties for the Karaganda district).
Sadovodstvo (Horticulture) 1960 : No. 10 : p. 57. [Russian].
Kron-princessa [Crown Princess], Saksonka [Saxon], Sejanec Tupolevoj [Tupoleva Seedling],

Komsomol, Indian and Roščinskaja were the most productive and drought resistant among varieties tested in the above district of Kazahstan. The last three were also early.

3833 Bauer, R.
Grundlagen und Methoden der Züchtung bei der Gartenerdbeere (*Fragaria ananassa* (Duch.). [**Principles and methods of breeding with the garden strawberry (*F. ananassa* Duch.)**].
Z. Pflanzenz. 1961 : **44** : 403–30.
The second part of this survey [cf. 2582] deals with breeding procedures; it is emphasized that breeding should be carried out on a regional basis. The advantages of using standardized values in assessing phenotypic characters are pointed out and ways of determining the heritable value are discussed. Combination breeding with varieties, crossing closely related species of the same level of ploidy and other aspects of polyploid breeding and the production of homozygous forms by agamospermy are considered.

3834 Topčijski, S.
(The worth of some strawberry varieties as a breeding component).
Naučn. Trud. selskostopan. Akad. Georgi Dimitrov. Agron. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1960 : **8** : 279–91. [Bulgarian].
A number of varieties crossed in various combinations have been studied. Progenies with Madame Moutot as one parent were generally medium early in ripening, but a few earlier forms were found in Madame Moutot x Surprise des Halles. A few plants in the Madame Moutot progenies were good in flavour. Progenies of Surprise des Halles flowered earlier than the others, the earliest being Surprise des Halles x Eva Macherauch. Most plants from this cross had early-ripening fruits regular in form but poor in flavour. In progenies from Eva Macherauch, the characters of the pollen parent were often predominant. Mieze Schindler transmitted late flowering, a high proportion of female flowers, dark-red fruits, red juice, sweet flavour, strong aroma and deep-set seeds to many of its hybrids.

3835 Sbitnev, N.
(The variety Neisčerpaemaja).
Sadovodstvo (Horticulture) 1960 : No. 7 : p. 52. [Russian].
The strawberry Neisčerpaemaja [Inexhaustible] outyielded all other ever-bearing varieties tested at Čehov and was distinguished by th high quality of its fruit.

3836 Lubkin, I. I.
(The variety Ada).
Sadovodstvo (Horticulture) 1960 : No. 7 : p. 51. [Russian].
The strawberry Ada has taller fruiting stalks than other ever-bearing varieties such as Sahalin and Neisčerpaemaja [Inexhaustible] and is more resistant to *Botrytis cinerea.*

3837 Basu, P. K.
***Verticillium* disease of strawberries.**
Canad. J. Bot. 1961 : **39** : 165–96.
Studies on 18 *Verticillium* isolates from a wide range of hosts indicated the existence of a number of physiological races whose pathogenicity on the susceptible strawberry variety Pocahontas ranged from mild to extremely virulent; the symptoms produced on Black Beauty egg plant and Geneva 11 and John Baer tomatoes were also recorded. In culture the isolates exhibited wide morphological variation and their colours ranged from white through grey to black. It is considered, however, that all the isolates belong to a single species, *V. albo-atrum,* and a key based on cultural, morphological and pathogenic characters is presented for their separation. A technique suitable for routine isolation of the pathogen is described. The studies were conducted at the Vineland Horticultural Experiment Station, Ont., where it was found that current-year runner plants of Pocahontas were virtually immune from this disease, in contrast to the over-wintered susceptible mother plants.

3838 Richardson, D. L.
Note on the reversion of the dwarf banana 'Cocos' to 'Gros Michel'.
Trop. Agriculture, Trin. 1961 : **38** : 35–37.
A plant of the dwarf mutant of Gros Michel, Cocos, which produced a Gros-Michel sucker on a plantation in Honduras is described. Since the sexual progenies of dwarf types pollinated by tall are known to be of short stature, it may be assumed that the change from tall Gros Michel to Cocos is due to a dominant mutation for shortened parts. Changes from short to tall stature are considerably more frequent than the forward mutation, 50–70 tall reversions having being observed among about 28,000 Cocos "mats" over a three-year period. Probably this change is the result of somatic loss of the dominant allele for dwarfing rather than reverse mutation.

3839 Lotz, F. M.
Methodik der Auslesezüchtung bei Geisenheimer Vinifera-Kreuzungen unter besonderer Berücksichtigung der quantitativen und qualitativen Leistungseigenschaften. **(Method of selection breeding in Geisenheim *vinifera* crosses, with special reference to quantitative and qualitative performance properties).**
Forschung und Beratung 1959 : **8A** : 56–60.
Local varieties of the Rheingau area and crosses involving them have been tested. Germination and seedling growth were better in crosses than in selfed plants. The results of tests for earliness, winter hardiness, the relation between wood development and frost damage, reliability of yield, berry yield, sugar content and wine quality were used to develop a point scale of evaluation, on the basis of which the crosses Mosel-Riesling x Sylvaner 10/50 and Mosel-Riesling x Sylvaner 11/30 were best.

3840 Katar'jan, T. G.
(Some results of the work at the Magarač All-Union Scientific Research Institute of Viticulture and Wine-making).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1960 : No. 7 : 48–51. [Russian].
Breeding work with vines and yeasts is mentioned. Among new vine hybrids which have reached an advanced trial stage are two early dessert varieties. Mention is made of introduction trials in the Crimea of other Soviet dessert varieties, 31 of which are now recommended for growing there. Many active yeast strains, including Transcarpathian strains which are tolerant of low temperatures, sulphurous acid and high concentrations of alcohol, have been selected and passed industrial trials. Some of them are capable of quick fermentation and make wines with 13–16% alcohol. Pure cultures of bacteria suitable for improvement of immature acid wines have been selected from Soviet and Bulgarian wines and have been made available to industry.

3841 Romanov, I. I.
(Central Asiatic vine varieties in Moldavia).
Sadovodstvo (Horticulture) 1960 : No. 10 : 42–44. [Russian].
An account is given of successful introduction trials of dessert varieties, all of which produced grapes of superior quality to those of the local standards. Katta-Kurgan outyielded all varieties, while Halili Belyj [White Halili] was the earliest and Tajfi Rozovyi [Pink Tajfi] produced the largest bunches.

3842 Gridnev, G. N.
(Vine varieties for the Zajsan valley).
Sadovodstvo (Horticulture) 1960 : No. 9 : p. 55. [Russian].
Four dessert and four wine varieties recommended for the above region of Kazahstan are listed. In trials at Zajsan these varieties surpassed all others in grape quality and yield.

3843 Banas, J.
Le Laboratoire de Vassal, origine et travaux. **(The Vassal Laboratory, origin and accomplishments).**
Progr. agric. vitic. 1960 : **153** : 101–07, 161–67, 211–16, 290–94, 347–52; **154** : 108–12.
At the Vassal Laboratory, more than 1600 new grape varieties of all types have been bred. Detailed information is provided on the techniques used at the laboratory. The origin and properties of a number of outstanding varieties are described.

3844 Žuravel', M. S.
(An instance of vegetative variability in Korinka Černaja).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1960 : No. 6 : p. 32. [Russian].
At the Central Asiatic research station of the Institute of Plant Industry, the vine Korinka Černaja [Black Currant] has given rise to a sport differing from the original variety in bearing large grapes containing seeds. The sport has been vegetatively and sexually reproduced. Some seedlings are thought to be useful as breeding material.

3845 Cosmo, I.
Vitigni ad uva da tavola raccomandabili per i nuovi impianti. **(Dessert grape varieties recommended for new plantations).**
Riv. Vitic. 1960 : **13** : 293–94, 319–29, 355–62.
The dessert vines grown in Italy are classified into seven groups according to time of maturity, the first two groups ripening respectively 20–30

days and 10–20 days before Chasselas doré. The varieties recommended are described and illustrated, with indications of their origin, time of ripening and main qualities. Lists are given of the vines of the various maturity classes recommended for the different Italian provinces for use (1) as dual-purpose grapes, (2) as purely dessert grapes and (3) for commercial planting; a certain number of more recent cultivars considered worthy of being tried are also listed.

3846 Soldatov, P. K.
(Seedless vine varieties).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1960 : No. 7 : 34–37. [Russian].

Descriptions are given of 11 seedless varieties selected from local Uzbek material. Most are suitable for drying while some may be used as dessert grapes or for wine making. Mention is made of other seedless selections from the Tagol valley in Uzbekistan and a few seedless hybrids bred at the Šreder Institute and the central Asiatic branch of the Institute of Plant Industry. The selections were either sports or seedlings of varieties tending to parthenocarpy which are thought to have arisen as a result of open pollination by seedless varieties.

3847 Gargiulo, A.
Inducción artificial de poliploidia mediante colchicina en *Vitis vinifera*.
(Artificial induction of polyploidy in *V. vinifera* with colchicine).
Vitis 1960 : **2** : 181–89.

Several methods of colchicine application were used to induce polyploidy in commercial varieties and hybrid lines of *V. vinifera*. The most effective concentration consisted of a 0·5% solution mixed with 10% glycerine. Morphological variations observed in tetraploid shoots are described [cf. XXVIII, 3404].

3848 Wagner, E.
Die Feststellung des Geschlechts bei Rebensämlingen. **(The determination of sex in grape seedlings).**
Vitis 1960 : **2** : 190–97.

Differences in floral morphology are described by which it is possible to distinguish between functionally hermaphrodite, female and male seedlings. In cases of doubt the pollen is examined; grains from male and hermaphrodite plants differ from those of female plants in having germination pores.

3849 Kozma, P., Polyák, D. (Mrs.) & Polyák, D.
Étude sur l'applicabilité des réactifs sexuels des plantes. **(A study of the use of plant sex indicators).**
Acta Bot. Acad. Sci. Hung. 1958 : **4** : 287–98.

The substance of this article has already been summarized from another source [cf. XXIX, 3108].

3850 Loomis, N. H.
Notes on a staminate grape selection as a parent.
J. Hered. 1960 : **51** : 212–13.

A seedling (Champanel x Diamond) with pistillate flowers (reflex stamens) was pollinated with a staminate selection from Aramon x Rupestris Ganzin 1. The progeny consisted of hermaphrodite and staminate plants in a 1 : 1 ratio, none of the seedlings having the pistillate type of flower of the ♀ parent. Aramon x Rupestris Ganzin 1 is apparently homozygous for the dominant gene (*Sp*) which allows the development of normal pollen, and heterozygous for the gene (*So*) which suppresses the development of normal ovules. It is considered to be the first staminate type known to be of this genetic constitution.

3851 Geisler, G.
Transpirationsuntersuchungen an Reben-Arten im Vergleich zu einer Kultursorte.
(Transpiration studies on grape species in comparison with a cultivated variety).
Z. Pflanzenz. 1961 : **44** : 321–47.

Transpiration was measured by weighing detached leaves. The rate of transpiration was highest in *Vitis armata* and the rates for the other species decreased in the order, *V. rupestris*, *V. solonis*, *V. berlandieri*, *V. cinerea*, *V. labrusca* and *V. riparia*. Cultivated varieties showed a rate of transpiration between that of *V. rupestris* and *V. solonis*. Interspecific crosses of *V. riparia* had relatively low rates of transpiration whilst crosses with more *V. vinifera* varieties in their parentage had higher rates. Considering the total leaf mass, *V. riparia* should lose more water than species with higher transpiration rates. Transpiration throughout the day varied in a characteristic way for each species. When the water supply was reduced, the species with a high rate of transpiration showed a more rapid reduction in transpiration than the species which normally transpire more

slowly; the loss of water is thought to affect the reaction of the stomata.

3852 Henke, O.
Biochemische und morphologische Untersuchungen an *Vitis*-Artbastarden. (**Biochemical and morphological investigations on *Vitis* interspecific hybrids**).
Züchter 1960 : **30** : 213–18.

All the flavonoids characteristic of *V. cinerea* were found in the leaves of hybrids of two varieties of this species. In comparison with other species *V. cinerea* synthesizes relatively low concentrations of flavonoids and this character was inherited by the hybrids. *V. cinerea* has a high polyphenol oxidase activity in the leaves and most of the hybrids were intermediate in this respect. No correlation was found between polyphenol oxidase activity and the concentration of flavonoids or between these characters and morphological characters of the leaf.

3853 Radler, F.
Über den Gehalt von Isoamylalkohol und Isobutylalkohol in Weinen von Kulturrebensorten und Neuzüchtungen. (**The content of isoamyl alcohol and isobutyl alcohol in wines from cultivated grape varieties and new hybrids**).
Vitis 1960 : **2** : 208–21.

No significant differences were found between the wines of these two groups in content of isoamyl alcohol and isobutyl alcohol.

3854 Korobkina, Z. V.
(**Changes in the chemical composition of grapes in storage**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1960 : No. 7 : 29–33. [Russian].

Details of changes in acidity, sugar : acid ratios and reductions in the contents of pectic substances and ascorbic acid in the fruit of 12 varieties differing in keeping quality are given.

3855 Németh, L.
Új borfajták értékbírálata új bírálati módszerrel. (**The evaluation of new wine varieties by means of a new method of assessment**).
Borgazdaság Budapest 1960 : **8** : 49–54 : from Hungar. agric. Rev. 1960 : **9** : No. 4 : 16–17. (Abst.).

Wines made of different grape varieties, including varieties still under trial, are being assessed at the Hungarian Institute of Crop Variety Testing on the basis of a scale in which points are given for (*a*) colour, (*b*) flavour and (*c*) taste, bouquet and general impression. Twofold replication is used and the samples are presented to the tasters in randomized order.

3856 Pogosjan, S. A. & Hačatrjan, S. S.
(**An experiment on breeding cold-resistant vine varieties under the growing conditions of the south**).
Agrobiologija (Agriobiology) 1959 : No. 6 : 852–60. [Russian].

An account is given of breeding hybrids which combine high quality of berries with resistance to spring frosts and short periods of winter temperatures of the order of 20°–30° C. below zero at the Armenian Viticultural Institute at Erivan. Hybrids with the required characters were obtained mostly by crossing high-quality local or introduced cultivars with the cold resistant hybrids 25 [Garandmak x Rišter 31] or 65 [Tavrezeni x *Vitis amurensis*]. Information on yield, maturation, phenological data, berry colour and the content of sugar and acids are provided for several selections together with the details of chemical analyses of the musts and wines of a few of them.
Seedlings of cold-resistant varieties bred at Moscow, Mičurinsk and Novočerkassk proved less hardy in Armenia than in the places of their origin. Surprisingly, the varieties from Novočerkassk were hardier than those originating further north. Later progenies of all these introduced hybrids acquired greater hardiness than the initial seedlings. However, the introductions included a few seedlings distinguished by cold resistance in the first year: most of them hybrids between unspecified central Asiatic varieties and *V. amurensis*.

3857 Geisler, G.
Untersuchungen über die Bedeutung des Transpirationsverhaltens und der Dürreresistenz von Sämlingen interspezifischer *Vitis*-Kreuzungen für die Unterlagenzüchtung. (**Investigations on the importance of the transpiration behaviour and drought resistance of seedlings of interspecific *Vitis* crosses for rootstock breeding**).
Züchter 1960 : **30** : 279–84.

Seedlings of the crosses Ob.575 F_1 x Riesling and G157 x Riesling were studied. With a plentiful supply of water the transpiration rate was greater in drought-resistant seedlings than in susceptible forms but with a restricted water supply transpiration was most reduced in the resistant seedlings. Some susceptible seedlings

showed an increase in transpiration under dry conditions probably due to failure of the stomatal mechanism. The most resistant seedlings had a less favourable effect on the performance of the scions than some of the less resistant seedlings.

3858 Geisler, G.
Untersuchungen zur Selektion dürreresistenter Reben-Sämlinge und Beziehungen zwischen der Dürreresistenz der Unterlage und den Leistungen des Edelreises. (**Investigations on the selection of drought-resistant grape seedlings and the relations between the drought resistance of the rootstock and the yields of the scion**).
Vitis 1960 : **2** : 198–207.

Seedlings with a well developed root system showed good resistance to drought. A strong and extensive root system was correlated with long shoots and a low degree of shoot branching and therefore these characters of the shoot may be used in selecting for drought resistance. In most years, rootstocks of medium drought resistance had the best effect on the yield of the scions but in a very dry year, the highest yields were obtained from vines grafted on the most resistant stocks.

3859 Grünzel, H.
Untersuchungen über die Oosporenbildung beim Falschen Mehltau der Weinrebe (*Peronospora viticola* de Bary). [**Investigations on oospore formation in grape mildew (*P. viticola* de Bary)**].
Z. PflKrankh. 1961 : **68** : 65–80.

The formation of oospores on a series of species and varieties of grape was studied; many oospores were produced on some of the resistant vines where conidia formation was inhibited. Populations of *P. viticola* from different districts showed variation in oospore formation under similar conditions of growth.

3860 Nastev, D.
(**A contribution to the study of *Vitis vinifera* subspecies *sylvestris* Gmel. in the Macedonian Peoples' Republic**).
God. Zborn. zemjod.-šumarsk. Fak. Univ. Skopje : Zemjod. (Ann. Rep. Fac. Agric. Sylvicult. Univ. Skopje : Agric.) 1959 : **12** : 293–318. [Macedonian].

V. vinifera ssp. *sylvestris* is reported to be much less susceptible to *Peronospora* and *Oidium* spp. in Macedonia than the local types of vine.

3861 Loladze, V. R.
(**The effect of rootstock on vine seedlings**).
Sadovodstvo (Horticulture) 1960 : No. 10 : 44–45. [Russian].

The yield and vigour of several hybrids bred at Telavi in Georgia were improved by grafting on *Phylloxera*-resistant stocks. The stock had the least effect on a *Phylloxera*-resistant hybrid of Mcvane x Mcvane.

FOREST TREES

7. Tagung der Arbeitsgemeinschaft für Forstgenetik und Forstpflanzenzüchtung 1960. (**Seventh meeting of the Working Party for Forestry Genetics and Forest Tree Breeding, 1960**).
Silv. genet. 1960 : **9** : 136–39.

The papers abstracted below were read at a meeting held in Munich during 27–28 July, 1960.

3862 *Rohmeder, E. Bastardierung in der Gattung* Abies. (*Hybridization in the genus* Abies). (*pp. 136–37*).

In studies at Munich, *A. veitchii* has been found to be distinct from other species in the smallness of its pollen grains. Of 35 hybrid combinations, involving a total of ten species, *A. veitchii* x *A. alba*, *A. concolor* x *A. nordmanniana*, *A. concolor* x *A. grandis*, *A. concolor* x *A. procera* and others have shown marked heterosis. *A. concolor* hybrids are generally heterotic but segregate for needle colour, the greatest superiority in growth occurring in hybrids with long, clear-green needles; this allows early diagnosis of the most productive hybrids. In studies of individual morphological, anatomical and physiological characters, any one character was found to be differently inherited according to the parental species used in the cross. Many hybrids were less susceptible to frost and better adapted to poor conditions than local German firs.

3863 *Eisenhut, G. Untersuchungen über die Morphologie und Ökologie der Waldbaumpollen.* (*Investigations on the morphology and ecology of forest-tree pollen*). (*p. 137*).

The pollen morphology of some 40 species has been studied microscopically under dark-ground illumination. Measurements of the pollen-grain dimensions showed less variation with this method than when mounted grains were measured under transmitted light.

3864 *Bartels, G. Enzymteste an Waldbäumen.* (*Enzyme tests on forest trees*). (*p. 137*).

The activity of malic dehydrogenase, diphosphofructose aldolase and glutamic-aspartic

transaminase was investigated in extracts of conifer seeds and pollen; in pollen of broad-leaved trees and in poplar leaves. In larch pollen the activities of the enzymes relative to each other varied according to clone. Poplar leaves also showed interclonal variation in enzyme activity, particularly in the diurnal changes in the relative activities of the three enzymes.

3865 *Holzer, K. Ergebnisse einer Fichten-sämlingstestung in der Kulturkammer.* (*Results of a spruce seedling test in the culture chamber*). (*pp. 137–38*).

Seedlings from 103 different mother trees were grown for three months under 16 hr. photo-periods. The altitude of the mother tree influenced various characters, in particular time of cessation of shoot growth, lengths of hypocotyl and shoot, water content of assimilating organs and ratios of shoot and root length to total length. Several characters also varied in relation to seed weight. Further experiments revealed an effect of day length upon cessation of growth and shoot length, especially in lowland types.

3866 *Fröhlich, H. J. Untersuchungen über Benadelungsverhältnisse verschiedener Fichten-Provenienzen.* (*Investigations on the needle-production relations of different spruce provenances*). (*p. 138*).

Among spruces from altitudes between 100 and 1200 m., a close relation between the number of annual sets of needles present and altitude could generally be detected. In dry years, the following three groups could be distinguished: (1) lowland types from east Prussia and Silesia, with numerous sets little affected by dry periods and showing good drought resistance; (2) alpine types, normally with few sets, showing appreciable leaf fall and damage as a result of drought; and (3) intermediate types from the Hercynean area. A parallel division was found with respect to drying and shedding of branches, this character being most marked in group (1) and least in (2). Measurements of the relation between weight and number of needles per 10 cm. shoot length revealed pronounced differences between individuals but not between groups of different provenance.

3867 *Schell, G. Keimschnelligkeit als Erbeigenschaft.* (*Rapidity of germination as a heritable character*). (*pp. 138–39*).

The seed from several harvests of 60 mother trees of different species was studied. Rapidity of germination was unrelated to later growth, time of flushing or 1000-grain weight, but showed some relation to provenance and variety.

3868 *Krahl-Urban, J. Einige Ergebnisse von Drehwuchs-Untersuchungen bei Rotbuchen.* (*Some results of investigations on twisted growth in beech*). (*p. 139*).

The proportion of trees with twisted growth varied widely from stand to stand and depended rather upon the provenance of the trees than upon the age or composition of the stand. Left-hand twisting was appreciably more frequent than right hand. The observations indicate that twisted growth is a dominant heritable character.

Report on Forest Research by the Forestry Commission for the year ended March, 1959 : Pp. ix + 186.

3869 *Wood, R. F., Lines, R. & Aldhous, J. R. Provenance studies.* (*pp. 47–53*).

Tsuga heterophylla. A study of 16 samples from different localities in north-west America was begun.

Black pine. Fourteen provenance types are being tested for ability to grow on elevated and exposed sites under conditions of atmospheric pollution.

Lodgepole pine. Nursery trials of North American pines showed those of coastal provenance (ranging from Vancouver Island, BC, to Southern Oregon) to grow better than those from the Cascade Mountains, Ore. No evidence was obtained that northern coastal types grow more slowly than southern.

Sitka spruce. A comparison was made of 3-year-old seedlings, representing 4 provenance types from Alaska, 4 from British Columbia, 2 each from Washington and Oregon and 1 from Denmark, at nurseries in Scotland and southern England. At the Scottish nurseries the tallest plants were those from southern Oregon and Queen Charlotte Islands, BC, while at Wareham, Dorset, the tallest plants originated from Queen Charlotte Islands, Vancouver Island and Forks, Wash.

Larch. Seeds of Japanese larch originating from 25 sources in Japan were grown; the best growth was shown by material from moderate elevations.

Douglas fir. Observations were made on frost resistance, flowering and height in 14 samples from Washington and 3 from Oregon. The Oregon material was severely damaged by frost. Among the Washington provenance types, those from the west coast were relatively free from damage. Late-flowering types were less affected

by frost than early-flowering types. No correlation was found between height and frost damage.

3870 *Jobling, J. Poplars and elms.* (*pp. 54–60*).

In varietal trials of poplar, Androscoggin was the most vigorous but was found to be susceptible to bacterial canker. A study of the elm varieties of Great Britain was initiated to discover those combining the timber properties required by the furniture trade with good sylvicultural characteristics.

3871 *Matthews, J. D., Mitchell, A. F. & Faulkner, R. Forest genetics.* (*pp. 61–66*).

Testing of plus trees of Douglas fir and Scots pine and progenies from crosses within and between European and Japanese larches continued. Seed orchards were laid down for the production of F_2 hybrids of European and Japanese larches and the first back crosses. Crosses were made between different provenance types of Scots pine and between Scots pine and *P. contorta*. Grafted plants from plus trees of Corsican pine were used as female parents in crosses with Scots pines of differing provenance. Observations on 13 beech clones produced by grafting scions from adult trees on to juvenile rootstocks, revealed great variation in time of first flowering and quantity of male and female flowers produced.

3872 *Peace, T. R. Forest pathology.* (*pp. 67–70*).

In a mixed plantation of pines and aspens tested for resistance to *Melampsora pinitorqua*, *Populus tremuloides* and *P. grandidentata* were not infected while the hybrid *P. tremula* x *P. tremuloides* was slightly infected. Some *P. tremula* clones were infected while others were not. Of the pine species tested, *Pinus resinosa*, *P. radiata*, *P. echinata*, *P. nigra*, *P. nigra* var. *calabrica*, *P. contorta*, *P. muricata* and *P. densiflora* were not infected while *P. sylvestris* and *P. pinaster* were; infection in the last-named species was severe. Selected clones of English elms are being tested for resistance to *Ceratocystis ulmi* and trials to test the resistance of silver firs to *Fomes annosus* have been laid down.

3873 *Wareing, P. F. & Longman, K. A. Studies on the physiology of flowering in forest trees.* (*pp. 109–10*).

In Scots pine, female-cone formation was found to be dependent on long-day conditions, no cones being initiated under short days. This also appears to be true of birch [cf. XXX,1995]. In 4–5-year-old seedlings of lodgepole pine, female cones were initiated under short days under outdoor conditions; no female cones were formed however under short days in a greenhouse at 15–20° C. In beech and Japanese larch no effects of day length on flowering have yet been detected.

3874 *Lines, R. Studies of the indumentum of young shoots of Norway spruce in some Scottish provenance experiments.* (*pp. 170–75*).

Observations on the hairiness of young shoots of *Picea abies* representing 18 provenance types from Scandinavia, Latvia, Poland, Germany, Switzerland, Italy, the middle Danube and eastern Europe revealed a highly significant difference between the Baltic and northern group of spruces which have a heavy indumentum, and the Hercynian-Carpathian and Alpine south-east European groups, which have a slight indumentum or none at all. The Hercynian-Carpathian group has more shoot hairs than the Alpine group but the difference is not significant. The variation does not appear to be closely correlated with latitude, longitude or altitude. A significant negative correlation was found between indumentum score and 1000-seed weight.

3875 Kopecky, F.
Erdészeti növénynemesítésünk helyzete és jövő feladatai. (**The position of forest tree breeding and future tasks**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1960 : **17** : 1–22.

Breeding work in Hungary includes the identification of plus trees, the development of collections, the establishment of clonal and progeny trials, interspecific hybridization and the induction of mutation and polyploidy. In poplar, rapid growth, straight trunks, drought resistance and immunity from rust have been observed among hybrids involving *Populus tremula*, *P. tremuloides*, *P. alba*, *P. grandidentata*, *P. canescens*, *P. nigra* and *P. deltoides*. Hybrids between sections were poor in growth and vigour.

Crosses have also been effected among *Pinus banksiana*, *P. nigra*, *P. densiflora*, *P. leucodermis*, *P. montana*, *P. ponderosa* and *P. sylvestris*.

Seed has been obtained from *Robinia pseudoacacia* x *R. monophylla* and the reciprocal, *R. pseudoacacia* x *R. pyramidalis*, *R. monophylla* x *R. pyramidalis*, *R. formosissima* x *R. pyramidalis* and *R. luxurians* x *R. pseudoacacia* (*semperflorens*) and the reciprocal; the last two crosses were effected with the aim of increasing the profuseness of flowering for the benefit of

beekeepers. Tetraploidy has been induced in *Robinia*. Attempts to establish inbred lines with a view to the exploitation of heterosis have failed because of the low fertility of the inbreds.

3876 Bergman, F.
Aktuellt från norra distriktet. (**News from the northern region**).
Skogen 1961 : **48** : 92–93.

The work of the Sundmo station in northern Sweden is concerned largely with the development of seed orchards. Progeny trials are also under way, and it is noted that progenies from crosses between Ångermanland spruce and Harz spruce and from *Larix sibirica* x *L. decidua* are promising with respect to growth and hardiness.

3877 Snyder, E. B.
A forest-genetics literature classification based on the Oxford decimal classification (ODC).
Silv. genet. 1960 : **9** : 167–68.

The author does not favour the complete revision of the genetics and breeding section of the ODC suggested by Rohmeder [cf. XXX, 3201]; he describes, instead, a modification of the ODC system which is used at the Southern Institute of Forest Genetics, Gulfpont, Miss.

3878 Laffitte, J. C.
Problemas forestales nacionales y la posible contribución experimental que puede realizar la Facultad de Agronomía. (**National forestry problems and the possible role of the Faculty of Agronomy in experimental work**).
Rev. Fac. Agron. Montevideo 1960 : No. 48 : Pp. 99.

This review deals with many aspects of forestry and includes a summary of some important problems in forest-tree genetics and possible methods for their solution.

3879 Hinkelmann, K. & Stern, K.
Kreuzungspläne zur Selektionszüchtung bei Waldbäumen. (**Crossing designs for selection breeding in forest trees**).
Silv. genet. 1960 : **9** : 121–33.

Two types of incomplete diallel crosses are outlined, the first (I) based on n_1 ♂ parents and n_2 ♀ parents and the second (II) on a total of n bisexual parents in which selfing is excluded. The corresponding complete diallels may be regarded as special cases of these types. Analysis of variance for the two types is described, which allows the calculation of expectation values for full-sib and half-sib covariances, additive genetic variance and dominance variance. An example of complete and incomplete diallels of type II involving 14 lines and 8 replications is worked out.

3880 Dietrichson, J.
Bruker vi mellomeuropeiske provenienser riktig? (**Do we use central European provenances correctly ?**)
Norsk Skogbruk 1961 : No. 2 : 67–70.

Anatomical studies of trees of varying provenance, chiefly spruce from Norway and central Europe, but also a few other conifers, indicate that trees of more southerly provenance tend to show a later and less well defined cessation of cambial growth in the autumn than those from the north. This anatomical difference appears to be related to differences in winter hardiness.

3881 Kopeczky, F.
A magtermelő állományok genetikai kérdései. (**The genetic problems of seed production stands**).
Erdész. Kutat. 1959 : **6** : 3–12 : from Hungar. agric. Rev. 1960 : **9** : No. 4 : p. 20. (Abst.).

At present, forest seed in Hungary is obtained from selected stands. The author recommends that, instead, seed-producing stands consisting of grafts from plus trees be established.

3882 Gajvoronskij, V. G.
(**Fossilized oak from the Pliocene in Taman'**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1960 : **135** : 968–70. [Russian].

The above fossil, found in the Taman' peninsula, was identified by its timber structure as belonging to *Quercus petraea*, which was hitherto not known to have existed in this region.

3883 Einspahr, D. W. & Joranson, P. N.
Late flowering in aspen and its relation to naturally occurring hybrids.
For. Sci. 1960 : **6** : 221–24.

Populus tremuloides normally flowers 10–12 days later than *P. grandidentata*; this constitutes a natural barrier to hybridization. Greenhouse and field studies at Appleton, Wis., have demonstrated the existence of late-flowering clones of *P. tremuloides*, able to produce abundant viable seed 8–10 days later than

normal clones. It is suggested that the occurrence of late clones accounts for the existence of natural hybrids between the two species.

3884 MORELLI, A.
L'ibrido selezionato B1M del Centro Selezione Pioppo di Villanova Solaro (Cuneo). [**The selected hybrid B1M of the Poplar Selection Centre at Villanova Solaro (Cuneo)**].
Agricoltura d. Venezie 1960 : **14** : 490–508.
Directions are given for growing the hybrid B1M, which is about to be registered. It is thought to be a hybrid of *Populus canadensis* ♀ x Carolina poplar, selected in 1935, and is described as a male tree, upright, with few branches in the lower portion, cylindrical trunk, many large leaves which are dark green and remain on the tree until late in the autumn, regular crown and greyish-white bark. Figures for growth increment and yield are presented; they show that at the age of 10 years the hybrid can give a yield of 15 c. per tree of commercial timber + 5·50 c. of branches; the yields per hectare are respectively 4200 c. + 1540 c., the trees being planted at a spacing of 6 x 6 m., giving 280 trees per ha. The mean annual ring breadth was 19 mm. The timber is ivory white, strong and elastic, with long uniform fibres. The hybrid has remained free from the main diseases that normally attack poplars and is recommended for cultivation on lands where *P. canadensis* is normally grown.

3885 SAMUSEV, F. F.
(Aspen with long petioles).
Lez. Hoz. (Forestry) 1960 : No. 9 : p. 93. [Russian].
A form of *Populus tremula* from the Leninogorsk district in southwestern Altaj had unusually large deltoid leaves with petioles 15–18 cm. long. Other forms, differing in growth rate, bark colour and the shape and size of leaves were also found in this region, including giant forms from the valley of the river Gromotuha.

3886 MARCET, E.
Modellversuch zur Frage der spezifischen Eignung bestimmter Pappelsorten für nicht optimale Böden. (**A preliminary experiment on the question of the specific adaptation of certain poplar varieties to sub-optimum soils).**
Silv. genet. 1960 : **9** : 93–101.
Dry-weight determinations made on different plant parts were carried out on two-year-old cuttings of eight poplar varieties grown on four different soil types. By means of F tests, highly significant differences due to soil were found for (*a*) above-ground parts, (*b*) subterranean parts, (*c*) roots, (*d*) roots less than 2 mm. in diameter, (*e*) cutting/roots, (*f*) shoot + branches/cutting + roots and (*g*) shoot + branches/roots. Differences due to variety were significant or highly significant for (*b*), (*c*), (*e*) and (*f*), and very highly significant for (*g*). Variety x soil interactions were significant for (*e*) and (*f*) and highly significant for (*g*). Intervarietal differences were smaller on the best soil than on unfavourable soils. In general, varieties well adapted to poor soils did less well on the best soil than the less widely adapted types.

3887 MARCET, E.
Beitrag zur Frühdiagnose von Tief- und-Hochlagensorten bei Schwarzpappelhybriden. (**Contribution to the early diagnosis of low and high altitude varieties in black-poplar hybrids).**
Schweiz. Z. Forstw. 1960 : **111** : 428–40.
Three cultivars from altitudes of 20, 435 and 1300 m. respectively were each grown at 388, 623 and 865 m. near Zürich. After two years, time of flushing and height and weight of the aerial parts were determined. Environment affected all three characters significantly, and for the first character varietal differences and variety x environment interactions were highly significant.

3888 KOPECKY, F.
Experimentelle Erzeugung von haploiden Weisspappeln (*Populus alba* L.). [**Experimental production of haploid white poplars (*P. alba* L.)**].
Silv. genet. 1960 : **9** : 102–05.
At Sárvár, Hungary, pollination of *P. alba* with *P. tremula* pollen in which low viability had been induced by storage under warm, moist conditions in an airtight flask resulted in seed set on only 0·2% of the catkins, 17 seeds being produced in all, of which six survived and proved to be haploid ($n = 19$). *P. alba* catkins set many seeds when pollinated by *P. nigra*, but only 3·2% were viable, five haploids being produced. Compared with diploids, the haploids were inferior in plant height at two years, and had leaves one third as large and stomata and epidermal cells about half as large.

3889 Bier, J. E.
The relation of bark moisture to the development of canker diseases caused by native, facultative parasites. IV. Pathogenicity studies of *Cryptodiaporthe salicella* (Fr.) Petrak, and *Fusarium lateritium* Nees., on *Populus trichocarpa* Torrey and Gray, *P.* 'robusta', *P. tremuloides* Michx., and *Salix* sp.
Canad. J. Bot. 1961 : **39** : 139–44.

Susceptibility to *Fusarium* and *Cryptodiaporthe* cankers in *Salix* sp. (probably *S. scouleriana*) and three *Populus* species was found to be related to plant vigour, apparently-resistant trees becoming infected when the relative turgidity of the dormant bark fell below 80%. There was some evidence that the threshold level for the development of *Cryptodiaporthe* canker may be higher in *P. trichocarpa* than in *P.* x *euramericana* 'robusta'.

3890 Bier, J. E.
The relation of bark moisture to the development of canker diseases caused by native, facultative parasites. V. Rooting behaviour and disease vulnerability in cuttings of *Populus trichocarpa* Torrey and Gray, and *P.* 'robusta'.
Canad. J. Bot. 1961 : **39** : 145–54.

It was found in a previous study [cf. 3889] that susceptibility to infection by facultative fungal parasites was related to the relative turgidiy of the bark. In experiments with cuttings from 1-year-old branches, highly significant correlations were found between relative turgidity of the bark, plant vigour, as expressed by the formation of basal callus and associated wound roots, and the average weight of cuttings of uniform size (25 cm. long with a middiameter of 1 cm.). It is considered that the last character may be a useful indicator of both potential rooting capacity and disease vulnerability of dormant nursery stocks.

3891 Vaartaja, O.
Ecotypic variation of photoperiodic response in trees especially in two *Populus* species.
For. Sci. 1960 : **6** : 200–06.

"The photoperiodic responses of seedlings of *Populus deltoides* and *P. tremuloides* from northern and southern origins were tested experimentally. The northern seedlings were inhibited by longer days than the southern seedlings. This interaction of photoperiod and origin was expressed in stem length, total dry weight, dry weight of stem without leaves, dry weight of tops with leaves, dry weight of roots, and number of leaves.

"The longest inhibitory ('critical') day-length was correlated with the latitude of the seed source. It is suggested that the photoperiodic response and ecotypes in these species have evolved in the populations of latitudinally distant sites as an indirect mechanism in utilization of the warm season and in preparation against the cold season.

"The weight of the root systems was found to be much greater in Saskatchewan aspen than in Wisconsin aspen (except under the critical daylength that inhibited Saskatchewan seedlings but not those from Wisconsin). This appears to be a genetic adaptation to the cold soils in the north." [Author's summary].

3892 Mišić, V.
Reliktni individualni varijabilitet Balkanske bukve u Garvan Klisuri (N.R. Makedonija) i Kavkaske bukve u Batumu (GSSR). [**The relic individual variability in the Balkan beech at Garvan Klisura (Macedonian People's Republic) and the Caucasian beech at Batum (Georgian SSR)**].
Zborn. Rad. biol. Inst. Beograd 1957 : 3 : No. 3 : Pp. 31.

Morphological and ecological variability in populations of *Fagus moesiaca* and *F. orientalis*, growing in relic forests at Garvan Klisura and at Batum, are discussed in relation to taxonomic and evolutionary problems. During the Tertiary period, both types of beech lived in mixed forests in the hilly regions and in coniferous forests of the mid-montane zones in the Balkan Peninsula and in the Caucasus. Genetically heterogeneous populations were able to persist in a particular habitat in the mixed forests; crossing between the two types of beech was limited in extent. Factors responsible for the preservation of relic individual variability and for the formation of new biotypes are discussed.

3893 Eifler, I.
Untersuchungen zur individuellen Bedingtheit des Kreuzungserfolges zwischen *Betula pendula* und *Betula pubescens*. (**Investigations on the individual conditioning of success in crossing between *B. pendula* and *B. pubescens***).
Silv. genet. 1960 : **9** : 159–65.

All possible crosses were made between six trees of *B. pendula* and six trees of *B. pubescens*; in general *B. pendula* x *B. pubescens* crosses were

more successful than the reciprocal crosses. Marked differences in combining ability were observed, two trees of each species being particularly good in this respect. Some combinations yielded only or mostly triploid progeny whilst others produced progeny with 28 chromosomes. The triploids were highly resistant to rust (*Melampsoridium betulinum*) but the 28-chromosome progenies were severely attacked.

3894 Ozolin, G. P.
(An experiment on breeding elm strains for resistance to Dutch elm disease).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1959 : No. 12 : 139–42. [Russian].

Forty healthy trees belonging to diverse species of *Ulmus* were selected from diseased stands in Taškent province and provided initial material for breeding for resistance to *Ceratocystis ulmi*. Open-pollinated seedlings of these hybrids were subjected to artificial infection, followed by selection of forms combining resistance with quick growth and other valuable economic characters. Over 2000 trees satisfactory in the above respects are now available for vegetative or sexual propagation.

3895 Kundziņš, A. & Pīrāgs, D.
Alkšņu hibrīdās formas Latvijas PSR (*Alnus glutinosa* x *Alnus incana*) un to koksnes anatomiskās īpatnības. [**Hybrid forms of alder (*A. glutinosa* x *A. incana*) in the Latvian SSR and the anatomical characteristics of their timber**].
Latv. PSR Zināt. Akad. Vestis 1959 : No. 8 : 161–68.

The above natural hybrids, found in Latvian forests, are quick growing and have high-quality timber resembling that of *A. glutinosa*. The hybrids are intermediate in morphological characteristics.

3896 Santamour, F. S. (Jun.).
Performance of five selected black locust clones at the Morris Arboretum.
Morris Arbor. Bull. 1960 : **11** : 67–70.

Robinia pseudoacacia 'Shipmast' (HC4022) has failed to live up to expectations, having a poorer growth rate and greater susceptibility to the locust borer *Megacyllene robiniae* than the four common locust clones HC4138, 4146, 4148 and 4149.

3897 Stefanov, B. & Gančev, A.
(The results of studies on willows in Bulgaria).
Izv. Inst. Gorata (News Inst. For.)/ Bull. Inst. For., Sofija 1960 : **6** : 45–56. [Bulgarian].

Types occurring in Bulgaria are described and include the following new varieties: *S. triandra* var. *amplifolia*; *S. fragilis* var. *divergens*; and *S. caprea* vars. *subglabrata*, *intermedia* and *megafoliata*. Two new hybrids have also been found, viz. *S. triandra* x *S. cinerea* and *S. purpurea* x *S. alba*.

3898 Von der Pahlen, E. K. de
Número de cromosomas de *Araucaria araucana*. (**The chromosome number of *A. araucana***).
Rev. Inst. agríc., B. Aires 1960 : **14** : 349–53.

The diploid chromosome number of this economically important conifer is reported to be 26.

3899 Fukarek, P.
A new race of pines in Bosnia.
Šumarsk. List (For. Lett.) 1960 : No. 84 : 152–56 : from Bull. Sci. Cons. Acad. Jugosl. 1960 : **5** : p. 127.

A pine population found near Sarajevo may have originated by hybridization between *Pinus mugo* and *P. heldreichii*. The provisional name *P. mugodermis* has been given to the new population.

3900 Stojanov, V. & Kolev, N.
(Variation in form and timber of pine).
Izv. Inst. Gorata (News Inst. For.)/ Bull. Inst. For., Sofija 1960 : **6** : 5–28. [Bulgarian].

Detailed studies of the wood and bark characters of 27 samples of *Pinus sylvestris* from the Rodopi mountains of Bulgaria allowed the following three groups to be distinguished: (1) scaly-barked pines with the heartwood forming 40% of the cross-sectional area at a height of 2 m., and having a kiln-dry weight of 0·38–0·70 g./cm.^{3} (mean 0·52) and a mean longitudinal compression resistance of 700 kg./cm.^{2}; (2) pines with the bark forming large thick plates, and having 55% heartwood, a dry weight of 0·34–0·66 g./cm.^{3} (mean 0·50) and a compression resistance of 540 kg./cm.^{2}; and (3) pines characterized by bark resembling that of spruce, and having 55% heartwood, a dry weight of 0·34–0·66 g./cm.^{3} (mean 0·42), a

compression resistance of 460 kg./cm.^{2} and appreciably greater porosity.

3901 Cook, S. A. & Stanley, R. G.
Tetrazolium chloride as an indicator of pine pollen germinability.
Silv. genet. 1960 : **9** : 134–36.

Pollen germinability was determined using 2,3,5-triphenyltetrazolium chloride (TTC), a colourless dye which is reduced by dehydrogenase enzymes to an insoluble red formazan complex in living cells; the results obtained were compared with those obtained by germination on agar. Of 6400 pollen grains sown on agar, 4448 germinated; of 6400 grains stained with TTC, 4270 were coloured red. It is concluded that a fair agreement can result when large samples are used.

3902 Ehrenberg, C. E.
Tillväxt och grenutveckling hos tallavkommor. **(Growth and branch development in pine progenies).**
Skogen 1961 : **48** : 6–8.

Further results of crosses between plus and minus trees effected in 1948 and 1949 are presented [cf. XXVII, 2290]. While plus x plus progenies were generally the most rapid in growth, they also showed marked environmental differences in height, which have persisted up to now. The superiority of the progeny of the minus x minus cross Å : 4 x Å : 3 over the open-pollinated progeny of the plus tree Y4015 during the first years has since become negligible. Branch angle appears to be little affected by environment, being relatively wide in the Y4015 progeny, intermediate in Å : 4 x Å : 3 and narrow in Å : 3 open-pollinated progeny. A tendency for plus-tree progenies to have a smaller branch length/tree height ratio than minus-tree progenies has been observed.

3903 Zobel, B., Thorbjornsen, E. & Henson, F.
Geographic, site and individual tree variation in wood properties of loblolly pine.
Silv. genet. 1960 : **9** : 149–58.

Specific gravity, tracheid length at 15 and 30 years and percentages of water-insoluble carbohydrates, α-cellulose and compression wood were studied in stands of *Pinus taeda* at various sites in seven eastern and south-eastern states of the USA. Highly significant differences were found between sites for all of the characters studied. Specific gravity and, to a lesser extent, tracheid length followed a geographic pattern; low specific gravity values were obtained for the north and north-west extremes of the species range, intermediate values for the Piedmont samples and high values for the coastal plain of North and South Carolina and Georgia. Intraplot variation was highly significant for specific gravity and tracheid length but not for α-cellulose or compression wood. Close correlation was found between tracheid length at 15 and at 30 years and between water-insoluble carbohydrates and α-cellulose. A positive correlation exists between specific gravity and α-cellulose while a high negative correlation was found between compression wood and α-cellulose. Some other characters were significantly correlated but the r values were rather small. For example, a significant negative correlation exists between specific gravity and tracheid length, but specific gravity differences account for only slightly more than 2·5% of the variation in tracheid length. Another correlation, also with a small r value, exists between tracheid length and α-cellulose. Both these correlations are probably affected by compression wood since the latter is correlated with both tracheid length and α-cellulose.

3904 Smith, R. H.
Resistance of pines to the pine reproduction weevil, *Cylindrocopturus eatoni*.
J. econ. Ent. 1960 : **53** : 1044–48.

Pinus jeffreyi and *P. ponderosa* are usually susceptible to *C. eatoni* but *P. coulteri* is resistant. *P. jeffreyi* x *P. coulteri*, the back cross of this combination with *P. jeffreyi* and the trispecific cross of this back cross with *P. ponderosa* are also resistant, as shown by data from forced attacks and natural infestations of young trees at the Institute of Forest Genetics, Placerville, Calif. Nonpreference, antibiosis and tolerance all appear to be involved in resistance. Intraspecific variation in *P. jeffreyi* and *P. ponderosa* with respect to reaction to the pest is heritable. Some evidence has been obtained suggesting that the female parent has a greater influence upon resistance than the male, possibly as the result of physiological effects of the maternal tissues upon the germinating embryo and thus upon the subsequent development or constitution of the seedling. Many other *Pinus* species and hybrids have been evaluated for resistance. *P. taeda*, *P. lambertina*, *P. torreyana*, *P. echinata*, *P. nigra*, *P. nigra* var. *calabrica* and *P. monticola* x *P. strobus* exhibited resistance.

3905 Schönbach, H.
Bidrag till frågan om den mellaneuropeiska granens genetiska variationer. (**Contribution to the question of the genetical variation of the central European spruce**).
Skogen 1961 : **48** : 88–90.

It is pointed out that Continental spruce, often contrasted with Swedish spruce as if it was a single geographical race, comprises many races with very different characters. This is illustrated by data from 20–30-year old provenance trials of central European spruces in the Erzgebirge, showing that, in general, growth of trees from mountains in eastern central Europe is better than that of trees from southwest Germany. Trees showing late flushing escape frost damage and usually grow better than early-flushing types even in relatively frost-free areas. Local races which are exceptions to the above generalizations are mentioned.

3906 Ruden, T.
Proveniensspørsmål i norsk skogbruk. (**Questions of provenance in Norwegian forestry**).
Norsk Skogbruk 1960 : No. 22 : 768–70.

Pinus sylvestris races do best in their latitude of origin, while in south Sweden and Norway Continental spruces do better than local races. Kiellander has suggested that spruce in Norway and Sweden is derived from two races, one from southern Europe and the other from Siberia, and that it still carries so many of the characteristics of the Siberian race that it is not well suited to southern Norway and Sweden. The author's observations show that cones with the scale form typical of the northern race occur with decreasing frequency from north to south Norway but are present even among southern trees which have spread from central Europe.

3907 Langlet, O.
Mellaneuropeiska granprovenienser i svenskt skogsbruk. (**Central European spruce provenances in Swedish forestry**).
K. Skogs- o. Lantbruksakad. Tidskr. 1960 : **99** : 259–329.

Spruces from 36 European localities were tested at three stations in Sweden, as part of an international provenance trial established in 1938. All extremely late-flushing types came from east European regions north of the Carpathians, and when grown at the most northerly station, their growth equalled that of early-flushing northern types; both these types were resistant to both spring and autumn frosts. In general, transference to an unaccustomed climate resulted in greater variations in growth in spruces from a warm climate than in those from a cold; transference to a colder locality generally decreased growth, and to a warmer locality increased it. Differences in growth at different latitudes could not be attributed to photoperiodic effects but appeared to be due mainly to the influence of temperature. Between different provenance groups, there was a negative relation between earliness and height at 19 years; within provenance groups, no such correlation was apparent and the tallest trees were those of intermediate earliness. Differences in volume production among provenance types became increasingly marked with age.

3908 Frund, C.
L'acclimatation des mélèzes de différentes provenances dans les forêts de l'École forestière. (**The acclimatization of larches of different provenances in the forests of the Forestry School**).
Schweiz. Z. Forstw. 1960 : **111** : 409–20.

Some 3000 trees from 53 localities have been studied at Uetliberg, Switzerland. Material from low altitudes was generally better than that from alpine localities.

3909 Langner, W.
Keimungsverlauf bei den Herkünften eines Provenienzversuches mit *Larix leptolepis* (Sieb. et Zucc.) Gord. [**The course of germination in the sources of a provenance trial with *L. leptolepis* (Sieb. et Zucc.) Gord.**].
Silv. genet. 1960 : **9** : 165–67.

Considerable differences in rate of germination were found between seeds from 22 autochthonous stands of Japanese larch. The causes of these differences are unknown but it is assumed that both genetic and environmental factors are involved.

3910 Melchior, G. H.
Erhöhung der Blühwilligkeit an Pfropflingen der Japanlärche (*Larix leptolepis* (Sieb. und Zucc.) Gord.). [**Increasing flower production in grafts of Japanese larch (*L. leptolepis* (Sieb. and Zucc.) Gord.)**].
Naturwissenschaften 1960 : **47** : p. 502.

The effectiveness of girdling, top bending and strangulation carried out during the last half of May [cf. 3911] was studied. After girdling, all treated trees of all clones flowered. Girdling and top bending increased the number of ♂

flowers, but the number of ♀ flowers was increased only by girdling. Strangulation was not fully effective until the second vegetative period after treatment, but was then equal in effect to girdling, which was the best of the three treatments. In the girdling treatments, clonal differences in response could be observed in poor years for flowering, but in good years clonal differences were apparent only among untreated clones.

3911 Melchior, G. H.
Ringelungsversuche zur Steigerung der Blühwilligkeit an japanischer Lärche (*Larix leptolepis* [Sieb. & Zucc.] Gord.) und an europäischer Lärche (*Larix decidua* Mill.). [Girdling experiments to increase the flowering capacity of Japanese larch (*L. leptolepis* [Sieb. & Zucc.] Gord.) and European larch (*L. decidua* Mill.)].
Silv. genet. 1960 : **9** : 105–11.

In studies conducted at the Wächtersbach branch of the Institute of Forest Genetics and Forest Tree Breeding, Germany, girdling of grafted larches promoted the production of both male and female flowers in the year of girdling if carried out before the end of May; if carried out at the end of June or later, survival rate was lower and flowering was promoted in the following year. European larch showed a greater increase in flowering and a smaller reduction in growth of the terminal shoot than Japanese larch.

VEGETABLES

Annual Report of the Glasshouse Crops Research Institute, Littlehampton, Sussex 1959 : Pp. 141.

3912 *Darby, L. A. General review of research work. 1. Plant breeding. (pp. 25–26).*

Lettuce. Light-coloured segregates were selected from F_2 families from crosses of Cheshunt 5B with lighter-coloured varieties. Some pale seedlings were obtained from irradiated Cheshunt 5B but these were mostly slow-growing; one family segregated 3 : 1 for dark green *v.* pale green colour.

Tomato. The F_5 progenies from crosses of Baby Lea with varieties of high fruit quality all have green stems and compact habit. Early and total crop weights compare favourably with the control variety Baby Lea and some promising lines are being selected. Crosses were made between Baby Lea and a number of genetic marker stocks carrying alleles for green stem or dwarf habit to investigate the mechanism which determines the green stem - compact habit complex in this variety.

3913 Neuzüchtungen. **(New varieties).**
Mitt. Klosterneuburg : Ser. B 1960 : **10** : 25–27.

In addition to fruit and vegetable varieties described elsewhere in *Plant Breeding Abstracts*, a new bean is mentioned. The climbing variety, Mont Caline 501, from Switzerland is vigorous and productive, the yellow pods being 15–20 cm. long and stringless; it ripens in about 70 days.

3914 Neuheiten für die Branche. **(Novelties for the trade).**
Saatgutwirtschaft 1961 : **13** : 5–6.

Onion. Titherna is a high-yielding variety which keeps well until late spring; it is regular in shape and has firm flesh. This variety ripens at the same time as Stuttgarter Riesen [Stuttgart Giant] and is suitable for various methods of cultivation.

Cucumber. Evergreen arose from a cross between Grochlitz and Delikatess; it is an outdoor variety with good field resistance to *Cladosporium* and *Erysiphe*. The fruit is of medium length and remains green; it is suitable for pickling and for fresh use.

Tomato. Sioux is an F_1 hybrid suitable for forcing and outdoor cultivation; it is resistant to disease and yields a high proportion of first-class fruit.

Broad bean. Hedosa is an early and high-yielding variety; it has long, broad pods containing large seeds with a good flavour.

Pea. Surpass is a very early marrowfat variety with medium sized seed suitable for processing. It is resistant to *Fusarium* and high temperatures.

3915 Kružilin, A. S. & Švedskaja, Z. M.
(The differentiation at the growing point in biennial root crops).
Fiz. Rasten. (Phys. Pl.) 1960 : **7** : 435–38. [Russian].

An account is given of studies of the developmental phases in biennial root crops, including carrot and beetroot. The results are thought to be of use in plant breeding, in particular for the selection of early and late forms at an early stage of development of the plants.

3916 Kelly, J. F. & Gabelman, W. H.
Variability in the tolerance of varieties and strains of red beet (*Beta vulgaris* L.) to boron deficiency.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 409–15.

As indicated by the percentages of roots showing black rot, the 57 varieties and strains tested in the field showed a wide range in tolerance of

boron deficiency. There has therefore been little deliberate selection by breeders for tolerance of this deficiency. The results indicated that strains with characteristic reactions to low concentrations of boron have however been developed within varieties, possibly as the result of natural selection on soils with high and low contents of boron. The wide and continuous range in degree of tolerance among the 57 entries suggested that the genetic control of this property is complex. Differences between varieties and strains when tested as seedlings in the greenhouse for reaction to boron deficiency in a nutrient solution were not significant.

3917 Kelly, J. F. & Gabelman, W. H.
Variability in the mineral composition of red beet (*Beta vulgaris* L.) varieties in relation to boron nutrition.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 416–24.

In a further study of the 57 varieties and strains referred to in an earlier paper [3916], the correlation between total boron content and symptoms of boron deficiency proved to be relatively low. As indicated by analysis of 25 of the varieties and strains, entries least tolerant of boron deficiency tended to accumulate the largest amounts of calcium in young leaf tissue. Significant differences were also detected between varieties and strains in magnesium content. Although the most and least tolerant entries tended towards extremes in relative concentrations of sodium, potassium and phosphorus, significant disparities between varieties and strains could not be established in these respects. Tolerance was related to more than one combination of cations. No mineral content, combination of mineral concentrations or ratio of mineral contents was however more closely associated with symptoms of boron deficiency than was calcium content. At least two types of tolerance were discerned, one in plants with a low content of calcium and magnesium, and the other in a genotype tolerant in spite of accumulation of large amounts of these cations. The results are briefly discussed with reference to problems of the mode of inheritance of tolerance and of breeding for this character.

3918 Moravec, J. & Kvasnička, S.
Posouzení světového sortimentu kulovitých karotek (*Daucus carota* L.). [**An evaluation of the world collection of round carrots (*D. carota* L.)**].
Bull. ČSAZV Výzkumný Ústav Zelinářský Olomouc 1960 : No. 4 : 13–32.

Yield was found to be more affected by heredity than by external climatic conditions. Both heredity and environment had considerable influence on the smoothness of the roots and cracking was mainly caused by external factors although internal factors also had considerable effect. Varietal differences in branching were observed in a dry year. Running to seed and the formation of typical round roots were influenced by both heredity and external factors. Koralle [Coral] was the best of the varieties studied, especially with regard to the smoothness of the roots and carotene production.

3919 Krickl, M.
Karotten. Veränderungen im Gehalt an Trockensubstanz und Carotin während der Vegetationszeit, bei der Lagerung, in verschiedenen Klimagebieten und züchterische Verbesserungsmöglichkeiten. (**Carrots. Changes in the content of dry matter and carotene during the vegetative period in storage, in different climatic regions and possibilities of improvement by breeding**).
Saatgutwirtschaft 1960 : **12** : 336–39; 1961 : **13** : 6–7, 40–42.

Variation in carotene content was found between strains and in the progeny of individual strains; more carotene was present in strains from low regions than in those from higher districts. Suggestions are made for selection procedure. High carotene content occurs in carrots which are intensely and uniformly coloured, have a low proportion of core and a cambium zone which is not easily seen.

3920 Izuka, M.
(**Aberrant phenomena caused by bud pollination and inbreeding in Cruciferous vegetables**).
Kyoto, Japan 1960 : Pp. 128. [Japanese].

The material studied comprised 16 varieties of radish, 2 of *Brassica rapa*, 1 of *B. chinensis* and 3 of *B. pekinensis*. Bud pollination of radish and *B. rapa* gave rise to a number of small seeds which proved to be heteroploid, $2n$ = 19–27 in radish, and $2n$ = 21–23 in *B. rapa*. Data are provided on the chromosome numbers of open-pollinated progenies of the heteroploids and of the progenies of heteroploid x diploid crosses. Small-seeded heteroploids also resulted from open pollination of several varieties. Syncyte formation at premeiotic mitosis was noted in radish and may be a factor in heteroploid production. Polyembryonic plants were noted in radish, one pair having 9_{II} and $9_{II} + 2_{I}$ components.

The following abnormalities appeared on selfing both radish and *Brassica* spp.: chlorophyll deficiencies, syncyte formation, male and female sterility, folded petals and reduced fertility.

3921 Courduroux, J. C.
Le déterminisme de la tubérisation chez quelques variétés de topinambours. (**The determination of tuberization in some varieties of Jerusalem artichoke**).
Bull. Soc. bot. Fr. 1960 : **107** : 243–47.
Certain varieties of *Helianthus tuberosus* required long or short-day environments for tuber formation. In other varieties, tuberization was not influenced by photoperiod but depended on specific temperature conditions.

3922 Kamhengsongkhram, Y.
(**Onion growing in Chiengmai**).
Kasikor (Farmer)/Kasikorn, Bangkok 1956 : **29** : 21–30. [Siamese].
Notes are given on the performance under Siamese conditions of some of the imported varieties available to farmers in the Chiengmai region of Siam.

3923 Davis, E. W.
Marker genes to facilitate roguing onion-seed fields.
Seed World 1960 : **87** : No. 5 : 4, 6.
The possible value of marker characters in the commercial production of F_1 hybrid seed is discussed.

3924 Juneja, S. L. & Gopal, R.
A case of a sectorial *chimera* in onion.
Curr. Sci. 1960 : **29** : p. 483.
The occurrence of a plant with green and albino longitudinal sectors is reported. The breeding behaviour of the plant is to be investigated.

3925 Tanaka, J.
Awahia: a new pungent onion for Hawaii.
Hawaii Fm. Sci. 1960 : **9** : No. 2 : 1–2.
Developed by crossing and selection within the Red Creole type at the Hawaii Agricultural Experiment Station, Awahia produces sweet, pungent, full-flavoured, nonsplitting bulbs.

3926 Tachibana, H. & Duran, R.
Pathogenicity of monosporic *versus* polysporic cultures of *Urocystis colchici*.
Phytopathology 1961 : **51** : p. 67. (Abst.).
Evidence of heterothallism in *U. colchici* was obtained from tests of the pathogenicity of combinations of monosporic lines on onion.

3927 Nichols, C. G., Larson, R. H. & Gabelman, W. H.
Relative pink root resistance of commercial onion hybrids and varieties.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 468–69.
Information is given on the reaction of 33 hybrids and varieties to a highly virulent strain of pink root (*Pyrenochaeta terrestris*). Eight southern types were rated as highly to moderately resistant.

3928 Khoshoo, T. N., Atal, C. K. & Sharma, V. B.
Cytotaxonomical and chemical investigations on the north-west Indian garlics.
Res. Bull. Panjab Univ. 1960 : **11** : 37–47.
Some samples of bulbs from vegetable markets in north-western India belonged to *Allium sativum* ($2n = 16$), and others to *A. ampeloprasum* ($2n = 48$). Possibly the gigas characters and late maturity of the latter species may be attributed to its polyploid condition. In this $6x$ species, 12 of the chromosomes each had a secondary constriction. Six of these appeared to represent three morphological pairs, but the remaining six were distinguishable from each other on the basis of the situation of the primary and secondary constrictions and length of the distal segment. It is suggested that this caryotypical heterozygosity, which is maintained by vegetative reproduction, is probably the result of hybridization prior to polyploidization. Observations on the caryotype of *A. sativum* were on the whole in agreement with those reported by Mensinkai [X, 312]. *A. ampeloprasum* has a much lower volatile-oil content than *A. sativum*. The former species, however, contains nontoxic saponins which may endow it with expectorant properties and explain its preferential use in the treatment of respiratory diseases in native medicine.

3929 Imazu, T. & Osawa, T.
(**Studies on *Aralia cordata*. III. Principally on morphological variation in cultivated and wild *A. cordata***).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1960 : **29** : 1–6. [Japanese].
A comparative biometrical morphological study is reported on a collection of wild and cultivated

varieties from all over Japan. The wild species could be associated into north Japanese and south Japanese varietal groups. The cultivated varieties were less variable than the wild and all appeared to be of the south Japanese type. [Cf. XXIX, 3180].

3930 Imazu, T. & Osawa, T.
(Studies on *Aralia cordata*. IV. On variation in the dormancy of the buds of cultivated and wild samples of *A. cordata*).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1960 : **29** : 126–28. [Japanese].

Wild samples collected all over Japan showed wide variation in bud dormancy but the differences could not be correlated with the latitude or altitude of provenance. The buds of cultivated varieties were fairly uniform in being but weakly dormant.

3931 Ellison, J. H., Reynard, G. B., Scheer, D. F. & Wagner, J. J.
Estimating comparative yields of asparagus strains without full season harvest records.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 376–81.

A three-years' study of 20 strains differing in genetic background indicated that full-season yield could be reliably estimated on the basis of early yield (from first 2 weeks of the harvest season) in the same season or brush vigour [as indicated by stalk number x (mean stalk diameter)^2] in the preceding autumn. Even more reliable estimates were obtained on the combined basis of early yield and brush vigour. Costly full-season cutting records are thus considered unnecessary. [Cf. 1001].

3932 Scheer, D. F. & Ellison, J. H.
Asparagus performance as related to seedling vigor.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 370–75.

Seedlings with low, medium and high vigour were selected 2½ months after sowing in the greenhouse and were transplanted to the field. The criterion of selection was an index derived from number of stalks x diameter of the largest stalk per plant. Survival of low-vigour seedlings in the field was poor compared with that of the other two categories. Most of the association found between seedling and mature-plant performance was attributable to the influence of ♀ plants. The investigation did not point to any useful technique of mass selection.

3933 Röbbelen, G.
Über die Kreuzungsunverträglichkeit verschiedener *Brassica*-Arten als Folge eines gehemmten Pollenschlauchwachstums. **(The cross incompatibility of different *Brassica* species as a result of inhibited pollen-tube growth).**
Züchter 1960 : **30** : 300–12.

All possible crosses were made between *Brassica oleracea, B. nigra, B. campestris, B. carinata, B. juncea* and *B. napus* and differences were noted in the extent to which pollen germination and growth of the pollen tube were inhibited. External conditions and the physiological state of the pollinated flower and mother plant were found to influence the inhibition. It is concluded that interspecific hybridizations are best carried out under cool and humid conditions using plants which are not very luxuriant in their growth; pollination should be effected two or three days before the buds open. Inhibition of pollen-tube growth after interspecific hybridization is compared to that which occurs after selfing in some species.

3934 Sinskaja, E. N.
(Corrections to the systematics and phylogeny of forage, vegetable and oil plants of the family Cruciferae).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1960 : **33** : No. 3 : 233–50. [Russian].

The author is now of the opinion that swede rape and turnip rape should be separated from the respective root forms as distinct species but no separation between winter and spring swede rape is considered necessary, both being classed as *Brassica napus*. Spring turnip rape is regarded as a phylogenetically young form that has evolved from winter turnip rape and since it has a different area it is classed as a separate species, *B. campestris*. Winter turnip rape on the other hand, having the same area and similar morphology to the European turnip, is classed with it as a subspecies of *B. rapoeuropea*. The Asiatic turnip is classed as *B. rapoasiatica* and the swede turnip as *B. napobrassica*. All these are distinct from Indian mustard, *B. juncea*, though confusion has occurred in certain published works. Revised descriptions, in Russian and Latin, are given of the species *B. rapoasiatica* and *B. rapoeuropea*, with several subspecies, some of them being further divided into conculta.

Natural crossing occurs fairly frequently between turnip and swede rape, less frequently between swede and turnip, turnip rape and swede rape and swede rape and turnip. Indian mustard rarely crosses with any other of the above species. Studies were made of the progenies of some anomalous plants found in populations of winter rape in the Ukraine, all of them showing a strong resemblance to hybrids of rape with Indian mustard. The progenies comprised plants of different types, some being annuals resembling rape, others biennials, forming a more or less well developed root resembling a turnip. The segregation of such types suggests that natural hybridization has occurred between rape and turnip, which is supported by the chromosome numbers, which varied between 32 and 34, which is intermediate between that of rape ($2n = 38$) and turnip ($2n = 20$). Other segregates resembled *B. juncea* ($2n = 36$) and may be hybrids between rape and a local early-flowering form of Indian mustard described as *B. juncea* var. *praecox*.

The progenitor of the turnip group is considered to have been a wild form resembling the winter turnip rape, growing in littoral areas, which gave rise to cultivated and weed forms of spring turnip rape, to cultivated winter turnip rape and to wild turnip. The turnip is thought to have been taken into cultivation first in the Indo-Afghan area after the Mediterranean receded, and this group still retains its primitive character. Hence they later migrated to eastern Asia, giving rise to the Japanese group under cultivation. The Asia Minor group, though close to the European, is somewhat more primitive and its origin is ascribed to a distinct set of wild forms and to an earlier period; it is nevertheless thought to have contributed towards the origin of some of the European ecotypes. Most of these however are thought to have arisen from hard-fleshed, grey northern types that migrated to the west and south. The fodder turnips are considered phylogenetically the youngest, having evolved from table varieties.

The swedes and swede rapes, with their characteristic chromosome number ($2n = 38$), are regarded as having arisen from crosses of cabbage ($2n = 18$) from the Atlantic shores with turnip rape ($2n = 20$), which gave rise to the primitive leaf rapes (ssp. *pabularia*, $2n = 36$), from which winter and spring rapes ($2n = 38$ or 36) evolved on the one hand and white-fleshed swedes ($2n = 38$) on the other, these latter giving rise to yellow-fleshed forms later, yellow flesh being recessive to white.

3935 Davies, D. R. & Wall, E. T.
Effect of gamma radiation on interspecific incompatibility within the genus *Brassica*.
Z. Vererblehre 1960 : **91** : 45–51.

The cross *B. oleracea* x *B. nigra* is usually unsuccessful, embryos aborting at an early stage of development. When the female parent was irradiated, 30 hybrids were produced from the 2767 flowers pollinated; all the hybrids were triploid, having two genomes of *B. oleracea* (C) and one of *B. nigra* (B). When the male parent was irradiated, four diploids of genomic constitution CB and one triploid (CCB) were obtained. An explanation of these results involving a change in the relationship of embryo and maternal or endosperm tissues is suggested.

3936 Nieuwhof, M., Garretsen, F. & Wiering, D.
Internal tipburn in white cabbage. II. The effect of some environmental factors.
Euphytica, Wageningen 1960 : **9** : 275–80.

The occurrence of tipburn is favoured by factors stimulating growth of the head, viz. early planting, late harvesting and heavy nitrogen dressing; these conditions are therefore recommended in selecting for resistance. Above a head weight of 4·5 kg., tipburn may continue to increase even after the cessation of growth.

3937 Helm, J.
Brokkoli und Spargelkohl. Beiträge zur Geschichte ihrer Kultur und zur Klärung ihrer morphologischen und taxonomischen Beziehungen untereinander sowie zum Blumenkohl. (**Broccoli and sprouting broccoli. Contributions to the history of their cultivation and to the clarification of their morphological and taxonomic relations to each other and also to cauliflower**).
Züchter 1960 : **30** : 223–41.

The literature on these subjects is examined in some detail. *Brassica oleracea* convar. *botrytis* is subdivided into two varieties. The var. *botrytis* includes cauliflower and heading broccoli whilst sprouting broccoli is placed in var. *italica*.

3938 **Irish plant-breeding successes.**
Fm. Bull., Dublin : Feb. 1961 : 7–8.

Brussels-sprout breeding is briefly outlined, from its initiation in about 1924 by G. O. Sherrard at University College, Dublin. Recent trials for

three years have shown Irish Elegance and Glasnevin 73/53 to be superior to the standard Evesham Special in early and total yields and in production of grade-I sprouts [cf. 1361].

3939 Johnson, A. G.
Assessment of vigour and uniformity in Brussels sprouts.
Euphytica, Wageningen 1960 : **9** : 338–50.

Measurements of stem length, leaf number, leaf size, total yield and marketable yield were made on two varieties, on inbred lines derived from them and on hybrids between the respective inbreds. Inbreeding depression varied considerably, both between different inbred lines and between different characters in the same line. The inbred lines were mostly later in sprout development and maturity than the parent varieties. The hybrids were inferior in stem length and, usually, in leaf number; they were variable in leaf size; they exceeded the parental mean in total yield; and they were superior to the better parent in marketable yield. This last improvement is thought to be the result of selection for uniformity of desirable sprout quality during inbreeding. Analysis of within-plot variances of stem length and leaf characters indicated that uniformity for these characters had not been much changed by inbreeding. These differences in increase of uniformity are attributed to varying rates of approach to homozygosis at different loci as a result of selection.

3940 Pound, G. S.
Badger Savoy, Savoy Supreme, Wisconsin Bloomsdale. New blue mold resistant spinach varieties.
Seed World 1960 : **87** : No. 11 : p. 30.

The above three varieties of the savoy type of spinach were developed cooperatively by the Agricultural Research Service of the US Department of Agriculture and the American Refrigerator Transit Company. They are homozygous for resistance to blue mould (*Peronospora effusa*), derived from PI140467. Badger Savoy resulted from (Viroflay x 140467) x (Virginia Savoy x Viroflay), followed by two back crosses with Virginia Savoy and ten generations of sibbing. On account of its erect habit, it can be readily harvested by machine. Wisconsin Bloomsdale was developed from the same initial double combination as Badger Savoy, followed by crosses with Dark Green Bloomsdale and Long Standing Bloomsdale and ten generations of sibbing. Less erect than Badger Savoy, it has an attractive sheen. Savoy Supreme has the same original parentage as Wisconsin Bloomsdale, but many generations of selection led to the development of a distinct type notable for its very dark green colour and extreme degree of crimping. All three varieties have a long season.

3941 **Spinach lines that offer advantages.**
Agric. Res., Wash. 1960 : **9** : No. 6 : 12–13.

The development of spinach lines capable of producing only female progeny is reported. The introduction of these lines, which are resistant to two (unspecified) races of blue mould (*Peronospora effusa*) and to mosaic disease, will eliminate the need for roguing unwanted male plants during hybrid seed production.

3942 Frazier, W. A., Sistrunk, W. A., Baggett, J. R., Calvin, L. & Azzam, H.
Correlation between certain seedling and mature plant characters in rhubarb.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 492–94.

Study of a heterozygous population consisting of about 1000 plants revealed low but significant positive correlations between seedlings and one-year-old plants with respect to vigour, upright growth and inner and outer petiole colour. The desirability of initiating selection at the seedling stage and of working with large populations was therefore indicated. Within mature plants, a highly significant positive correlation was detected between outer and inner petiole colour, while inner petiole colour was negatively but nonsignificantly associated with vigour and upright growth.

3943 Štambera, J.
Šlechtění jarního hlávkového salátu pro nejranější sklinzě. **(Breeding spring cabbage lettuce for the earliest crops).**
Bull. ČSAZV Výzkumný Ústav Zelinářský Olomouc 1960 : No. 4 : 1–12.

A new variety selected from a chance cross at the Vegetable Research Institute at Olomouc matures 5–6 days earlier than Král Máye [May King] and well hardened seedlings survive temporary falls in temperature to — 10° C. It has an average—or above average—sized head of firmly closed leaves and a fragile sweet stalk. This new variety gives good results when forced in frames or cold glasshouses.

3944 Verhoeff, K.
Veredeling van sla op resistentie tegen valse meeldauw ("wit"), veroorzaakt door *Bremia lactucae* R. (**Breeding lettuce for resistance to downy mildew caused by *B. lactucae* R.**).
Zaadbelangen 1960 : **14** : 498–99.
Sources of resistance to *B. lactucae* have been found in *Lactuca serriola, L. saligna* and some cultivated types. Testing for resistance may be effected by spraying plants grown in soil blocks with a freshly prepared spore suspension. The *Bremia*-resistant parents are susceptible to *Erysiphe* and are being crossed with varieties resistant to the latter pathogen.

3945 Schnathorst, W. C.
Heterothallism in the lettuce strain of *Erysiphe cichoracearum*.
Mycologia 1959 : **51** : 708–11.
The strain attacking cultivated lettuce in California proved to be heterothallic. Crosses between different strains were effected. The possible role of hybridization between strains in the origin of new strains of this pathogen is discussed.

3946 Dunn, J. A.
Varietal resistance of lettuce to attack by the lettuce root aphid, *Pemphigus bursarius* (L.).
Ann. appl. Biol. 1960 : **48** : 764–70.
Pronounced varietal disparities in susceptibility to attack by the above aphid have been observed at the National Vegetable Research Station, Wellesbourne, England. Resistance has been high in White Favourite, Imperial E–4, 19551–M, Imperial 45634–M, Continuity and Iceberg. Midas, Salad Bowl and Imperial 4164 each appeared to be a mixture of susceptible and resistant plants. Resistance evidently depended upon antibiosis. It is suggested that varietal differences in root-sap composition may be responsible for the differences in susceptibility, although analyses of water and alcohol extracts of root sap from resistant and susceptible varieties gave inconsistent results.

3947 Pelet, F., Gagnebin, F. & Gauthier, A.
La mosaïque de la laitue. (**Lettuce mosaic**).
Rev. hort. suisse 1961 : **34** : 73–77.
A large number of lettuce varieties are reported to have shown some resistance to mosaic.

3948 Quagliotti, L.
Problemi attuali nel miglioramento genetico del sedano (*Apium graveolens* L.) in Piemonte. [**Current problems of breeding celery (*A. graveolens* L.) in Piedmont**].
Sementi elette 1960 : **6** : No. 6 : 26–31.
A review of the literature is presented.

3949 Dutta, S. K. & Garber, E. D.
Genetics of phytopathogenic fungi. III. An attempt to demonstrate the parasexual cycle in *Colletotrichum lagenarium*.
Bot. Gaz. 1960 : **122** : 118–21.
The first step in the demonstration of parasexuality in *C. lagenarium* (*Glomerella lagenaria*), viz. production of heterocaryons, has been accomplished. Attempts to isolate spores with a diploid nucleus were however unsuccessful. Possible explanations of this failure are suggested.

3950 Tousson, T. A. & Snyder, W. C.
The pathogenicity, distribution, and control of two races of *Fusarium* (*Hypomyces*) *solani* f. *cucurbitae*.
Phytopathology 1961 : **51** : 17–22.
In addition to the world-wide form of *F.* (*Hypomyces*) *solani* f. *cucurbitae* causing root, stem and fruit rotting and now designated race 1, a second race (race 2) has been distinguished in California. This race attacked only the fruits of cucurbits but was similar morphologically to race 1.

3951 Bohn, G. W. & Mann, L. K.
Nectarless, a yield-reducing mutant character in the muskmelon.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 455–59.
The nectarless condition, discovered in breeding material at the Southwestern Irrigation Field Station, Calif., affects both staminate and perfect flowers. The "dry" nectaries are smaller than normal nectaries; a large portion of the nectar-producing tissue consists of collapsed cells and contains little starch before anthesis. Honey bees avoid nectarless flowers, especially in extensive plantings and in localities where other sources of their food are abundant. Fruit set is thus reduced and delayed. The nectarless character has potential value in studies of population genetics in the musk melon.

3952 Stevenson, E. C. & Johnson, K. W.
Two improved watermelon varieties for Indiana—Princeton and Charleston Gray 133.
Res. Bull. Purdue Univ. 1961 : No. 715 : Pp. 6.

The above varieties have been developed for use on soils highly infested with *Fusarium* wilt in southern Indiana. Princeton, derived from the local open-pollinated variety Blackhawk, is equal to Purdue Hawkesbury in wilt resistance. Although not equal to Charleston Gray in quality and transportability, it is however better in these respects than Purdue Hawkesbury. Selected from Charleston Gray, Charleston Gray 133 has the advantage of slightly better wilt resistance than the original variety [XXV, 1478].

3953 Wall, J. R.
Use of marker genes in producing triploid watermelons.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 577–81.

Paired plants of the 2*x* variety Sugar Baby and 4*x* parent W–687 were allowed to intercross at random. Sugar Baby bears dark-green, faintly striped round fruits and W–687 light-green, striped round fruits. Dark-green colour was incompletely dominant over light-green, striped rind. When the allele for dark green interacted with two alleles for the light-green, striped type in the triploids resulting from the intercrossing, there was a gene dosage effect, the fruits having a medium-green, striped rind. All three rind patterns were easily identifiable. Of the plants raised from the seeds produced by the 4*x* parents, 83·6% were triploids and 16·4% tetraploids. The high percentage of 3*x* progeny is attributed to partial 4*x* sterility and faster pollen-tube growth of haploid pollen. The possibilities of using seedling markers and other rind patterns to distinguish 3*x* hybrids are considered.

3954 Shimotsuma, M. & Ogawa, Y.
Cytogenetical studies in the genus *Citrullus*, III. Bitter substances in fruits of *C. colocynthis* Schrad. and *C. vulgaris* Schrad.
Idengaku Zasshi/Jap. J. Genet. 1960 : **35** : 143–52.

The presence of citbittols in this genus is conditioned by a single dominant gene. The wide variation found in the amount and proportions of citbittols in diploid and tetraploid strains of the parental species and in diploid, triploid and tetraploid interspecific hybrids appears to be controlled by polygenes. [Cf. 2697].

3955 Akiya, R., Ito, K. & Kondo, Y.
(Studies on the root system of cucurbits, I. On intervarietal differences in the root system of the water melon).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1960 : **29** : 121–25. [Japanese].

Descriptions are given of the root system in Asahiyamato [Japanese Rising Sun], Fumin, Miyako 3, 3*x* Koyo, 4*x* Asahiyamato, 4*x* Fumin, 4*x* Koteifuken, F_1 (Fumin x Asahiyamato) and F_1 (Miyako 3 x Fumin). Root development was most vigorous in Miyako 3, the polyploids and the hybrids.

3956 Weiling, F.
Genomanalytische Untersuchungen an F_1-Artbastarden zwischen Moschuskürbis (*Cucurbita moschata* Duch.) und der Wildart *Cucurbita foetidissima* HBK.
(Genome analytical investigations on F_1 interspecific hybrids between *C. moschata* Duch. and the wild species *C. foetidissima* HBK).
Züchter 1960 : **30** : 247–50.

Data on chromosome behaviour during meiosis are presented. *C. foetidissima* resembles *C. maxima*, *C. pepo*, *C. mixta* and *C. moschata* in cytological behaviour, although it differs in morphological and physiological characters. *C. moschata* x *C. foetidissima* differs cytologically from *C. maxima* x *C. ficifolia*; the last mentioned species is thought to differ from the others in genomic constitution [cf. XXX, 867].

3957 Petrov, H.
(New white varieties of pumpkin).
Gradinarstvo (Horticulture) 1959 : **1** : 4–5 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 100 : p. 70. [Bulgarian]. (Mimeographed).

The new varieties Biser 51–11k103 and Biser 51–11k14/2, developed at the Experimental Station for Vegetables, Gorna Orjahovica, Bulgaria, yield respectively 4% and 43% more than the standard variety Plovdiv 48/4. They are also superior in respect of the content of dry matter and the fruit may be stored without special treatment until the end of January.

3958 Kalajdžiev, I.
(A new fodder pumpkin variety, Marica 1–I).
Nauč. Trud. nauč.-izsled. Inst. Furazite (Sci. Proc. sci.-res. Inst. For.), Pleven 1959 : **1** : 27–33 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 92 : 64–65. [Bulgarian]. (Mimeographed).

Marica 1–I, a variety of *Cucurbita maxima*, was bred from selections of the Plovdiv and Pazardžik native populations; it has surpassed locally grown varieties in fruit and protein production and fodder value. It is a fairly late variety with a vegetative period of 140–160 days.

3959 Hayase, H.
Physiological studies on the pollination of the genus *Cucurbita*, with special reference to the fertilizing power of pollen and anther dehiscence.
Hokkaido Nogyo Shikenjo Hokoku/Rep. Hokkaido agric. Exp. Sta. 1960 : No. 54 : Pp. 74.

A detailed summary is given of investigations which have already been reported [cf. XXIX, 819].

3960 Grebenščikov, I.
Notulae cucurbitologicae IV. – Ein Beispiel für gesetzmässige Verschiedenheit der Fruchtform innerhalb einer Pflanze. **(Notes on cucurbits IV. An example of regular variation of the fruit form within a plant).**
Kulturpflanze, Berlin 1960 : **8** : 138–67.

Four strains of an inbred variety of *Cucurbita pepo* convar. *patissonina* var. *radiata* were analysed. In three strains, the distribution curves for the shape of the first fruit and the form of the blossom end of the fruit were skewed, the form of the blossom end being weakly correlated with fruit shape. There was no marked correlation between fruit shape and weight. The difference between the shape of the first fruit and that of the second was highly significant; the difference in weight between first and second fruits was found to be weakly significant in an analysis of variance but no significant differences were found using the *t* test. Differences in fruit form between strains were slightly significant.

3961 Jenkins, S. F. (Jun.) & Winstead, N. N
Observations on the sexual stage of *Colletotrichum orbiculare*.
Science 1961 : **133** : 581–82.

An isolate of *C. orbiculare* (= *C. lagenarium*) race 1 derived from *Lagenaria leucantha* var. *longissima* 'Cucuzzi' in North Carolina formed the perfect stage in culture. This isolate has been identified as a species of *Glomerella*; further studies are in progress to establish its taxonomic position more exactly. The isolate produced very few ascospores when selfed. Ascospores were however formed in abundance when it was mated with certain other isolates of *C. orbiculare*.

3962 Lefering, T. W.
De stand van de veredeling bij de augurk op de proeftuin te Venlo. **(The position of cucumber breeding at the Venlo experimental station).**
Zaadbelangen 1961 : **15** : 56, 58–59.

At the above station in Limburg, Netherlands, crosses of Guntruud (susceptible to *Erysiphe cichoracearum*) with Porto Rico L10, which shows a certain degree of field resistance, have shown no superiority over Guntruud in resistance but have led to the production of selection 317A, which gives better yields and has a lower tendency to form hollow fruits than Guntruud. Selection 317A is, like its parents, resistant to mosaic. Attempts to breed for combined resistance to other diseases are in progress.

3963 Marchesi, G.
Altri due anni di confronti fra cultivar di pomodoro (1958–59). **[Two more years of comparisons between tomato cultivars (1958–59)].**
Ann. Fac. Agr., Milano 1960 : **78** : No. 2 : 161–82.

Further observations [cf. XXX, 871] with 33 cultivars in 1958 showed Gimar to be outstanding over the rest of the conserving varieties in respect of yield and resistance to a dry rot caused by a combined attack of *Phytophthora infestans*, *Alternaria solani*, *Cladosporium fulvum* and *Septoria lycopersici*, known locally as "brusone". In 1959 Gimar was again one of the best in the above respects, though somewhat deficient in acidity. Among the table varieties, line 33 Centro Terminillo was resistant to brusone but inferior in other respects whereas Nunhem's Tuckqueen was susceptible but good in other respects. Of the five peeling varieties tested, the best were Lampadone Élite, Fiaschetta Torrelama and Lampadina 3.

3964 Orienterende forsøg med sorter af tomater i væksthus 1959. **(Preliminary trials of tomato varieties in the greenhouse in 1959).**
Tidsskr. Planteavl 1960 : **64** : 705–08.

Descriptive notes on 22 varieties, including six

F_1 hybrids, are given, together with data on yield and fruit quality.

3965 Murtazov, T.
(Achievements and aims in tomato breeding).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1959 : No. 11 : 40–42. [Bulgarian].
Descriptions are given of varieties and hybrids bred in recent years in Bulgaria. They comprise indoor and outdoor tomatoes differing in maturation period and productive of high-quality fruit for direct use or preparation of purée and juice. Some of these varieties and hybrids have been previously noted: others include the high-yielding determinate varieties Sofia, Izobilie [Abundance] and Vitoša; 2870/1[2] and XXIV, which are resistant to *Cladosporium*; an unspecified variety resistant to *Bacterium michiganense*; and an inbred line also resistant to this bacterial wilt whose resistance has been transferred to 10 x Bison and several other heterotic hybrids.

3966 Sillona, G.
Performance test and selection of tomato hybrids for wet season.
Araneta J. Agric. 1960 : **7** : 94–115.
A programme for the development of tomato varieties suitable for rainy-season cultivation was undertaken at Araneta University. Data are provided on the performance of eight lines in varietal trials conducted during 1959–1960. The outstanding lines, Laguna x (Pearl Harbor x Laguna) and Native Selected x (Pearl Harbor x Laguna), are now undergoing further selection.

3967 Gardé, A.
O fósforo radioactivo no melhoramento das plantas. **(Radioactive phosphorus in plant improvement).**
Agricultura, Lisboa 1960 : No. 6 : p. 28. [Cf. 1034].

3968 Wann, E. V. & McFerran, J.
Studies of the inheritance of red color in fruits of *Lycopersicon pimpinellifolium* Mill.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 524–29.
According to F_1–F_3 data from a cross of the red-fleshed variety Indark of *L. esculentum* with *L. pimpinellifolium* 'PI79532', inheritance of the dark red fruit colour of the latter parent was multigenic and, as suggested by the intermediate colour of the F_1, probably also involved gene interaction.

3969 Gröber, K.
Ein neuartig balanciertes Letalfaktorensystem bei *Lycopersicon esculentum* Mill. **(A new kind of balanced lethal factor system in *L. esculentum* Mill.).**
Kulturpflanze, Berlin 1960 : **8** : 32–89.
Studies of the lethal factor system in the X-ray induced mutant *gilva* are reported; the gene *gil* acts together with the allele series +, let^x, let^v. In addition to heterozygous plants segregating in the Mendelian ratio of 3 green : 1 yellow, there are two types with abnormal segregation; in one case the ratio is 1·6 green : 1 yellow and in the other 18·0 green : 1 yellow. The last mentioned type arises as a result of a genotype being viable which is heterozygous for the two *let* mutant alleles.

3970 Popović, M. & Mandić, S.
Proizvodnja heterozisnog semena crvenog patlidžana kod nas. **(The production of heterotic tomato seed in our country).**
Savremen. Poljopr., Novi Sad 1959 : **7** : 997–1004.
This report on seed production of 10 x Bison and Zarja [Dawn] x Komet [Comet] at Smederevska Palanka refers to the prospects of utilizing male-sterile forms of tomato.

3971 Betlach, J., Tichý, S. & Šmerda, V.
Výsledky heterosního šlechtění nízkých rajčat. **(The results of heterosis breeding of bush tomatoes).**
Bull. ČSAZV Výzkumný Ústav Zelinářsky Olomouc 1960 : No. 4 : 65–94.
The 21 hybrid progenies studied showed an average increase in yield of 23·3% over that of the better parent during five years, the increase being 27·8% in comparison with a test variety. The hybrids were intermediate in their time of maturity. They produced on an average 73·45% of first and second class fruits, whereas the Czech bush tomato collection produced 64·68%. Also the fruits of the hybrids were firmer and more uniform. Five parental combinations producing satisfactory progeny are also recommended for future breeding.

3972 Walkof, C.
Improvement of tomato fruit size and maturity by backcross breeding.
Canad. J. Pl. Sci. 1961 : **41** : 24–30.
Nine research institutions in western Canada cooperated in a project designed to develop an early-maturing, large-fruited tomato. Among

the lines derived from (Earlinorth x Morden BB3) x Morden BB3 was Morden 1. The fruit size of this line was 44·33% larger than in Morden BB3, while the maturity date was three days earlier. The fruit size of Kenville 1, one of the lines derived from (Earlinorth x Morden BB3) x Earlinorth, was 117·15% larger than in Earlinorth, while the maturity period was identical. "Combination improvement employing correlation data for selecting the largest-fruited, earliest-ripening genotypes contributed to breeding progress. Heritability estimates indicated the selection potential of the cross. The fasciation character was found to be associated with the development of large fruit size and late maturity in certain breeding lines."

3973 Georgieva, R., Dimitrova, E. & Georgiev, D.
Influence de certains facteurs physiques sur le caractère de l'hérédité dans l'hybridization des tomates. B. Influence des ultrasons. (**The influence of certain physical factors on the character of the heredity in hybridization of tomatoes. B. The influence of ultrasonic waves**).
CR Acad. bulg. Sci. 1959 : **12** : No. 5 : 467–70 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 91 : p. 64. (Mimeographed).

Pollen of *Lycopersicon pimpinellifolium* was treated with ultrasonic waves of 30,000, 25,000 or 20,000 H_z. frequency for 1–40 min. before being used in crosses with *L. esculentum*. In two cases no fruit was formed. Hybrids of three kinds were obtained: (1) hybrids resembling the mother plant, with large leaves and flowers; (2) intermediate hybrids, with leaves like those of the mother plant but resembling the control hybrid in flowering, the fruit however being larger than that of the control; and (3) hybrids resembling the control hybrids in leaf and fruit form. Deviations from the control were also observed in physiological and biochemical characters. Hybrids bearing the largest fruits had the lowest content of dry matter, sugar and vitamin C.

3974 Stubbe, H.
Mutanten der wildtomate *Lycopersicon pimpinellifolium* (Jusl.) Mill. I. [**Mutants of the wild tomato *L. pimpinellifolium* (Jusl.) Mill. I.**].
Kulturpflanze, Berlin 1960 : **8** : 110–37.

Fifty mutants are described.

3975 Yu, S.-A. & Yeager, A. F.
Ten heritable mutations found in the tomato following irradiation with X-rays and thermal neutrons.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 538–42.

The characteristics and mode of inheritance of ten mutants of the tomato Chatham are described [cf. 1033].

3976 Fučik, V.
The seed progeny of Solanaceae chimeras.
Biol. Plant., Praha 1960 : **2** : 216–22.

Two chimeras, *Solanum koelreuterianum* and *S. gaertnerianum*, were obtained by grafting *S. nigrum* on to *Lycopersicon esculentum*. No seed was obtained from the former but the latter produced fruits ranging from flattened to oval to very elongated; elongated fruits were invariably seedless. All of 40 seedlings obtained resembled the *S. nigrum* control and appeared not to have been influenced by association with *L. esculentum* tissues.

3977 Kononkov, P. F.
(**Training tomatoes for earliness by raising intervarietal hybrids for transplanting in warm frames containing soil with reduced moisture content**).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1959 : No. 10 : 27–30. [Russian].

The above treatment improved earliness of hybrids and increased the yield and size of fruit at Odessa, the changes being heritable.

3978 Rajki Cicer, E.
Tojásgyümölcs (*S. melongena* L.) vegetatív hibridek. [**Vegetative hybrids of egg plant (*S. melongena* L.)**].
Növénytermelés 1960 : **9** : 205–30.

Reciprocal grafts were made between a purple-fruited (P) variety (ssp. *occidentale* var. *bulgaricum*) and a white-fruited (W) variety (ssp. *subspontaneum* var. *leucoum*). Of grafts in which stock and scion were of the same age (7–8 leaves), 83·3–100% bore fruit, while for those in which the scion was a seedling the percentage setting fruit was below 50. W scions of both types grafted on P stocks showed changes in colour, shape and dimensions of the fruit; but in the only successful reverse graft, no alteration was observed. The changes in W scions were maintained on further vegetative propagation.

In F_1 hybrids of generative intervarietal crosses, the fruits were lilac and darker in colour and more oval in shape where P was the ♀ parent than in the reciprocal cross; size of leaf and fruit was intermediate. The seed progenies from intravarietal grafts and unaltered intervarietal grafts showed no significant differences from the initial varieties. Progenies from the seed of two W/P grafts contained teratological plants, some of which bore parthenocarpic fruits. Another W/P graft gave seedlings in the following fruit-colour classes: 10% white, 3·75% white with purple stripes, 22·5% green or green with a white tip, 8·75% green with purple stripes, 38·75% purple and 16·25% lilac with some darker stripes. These plants also showed recombination of such parental characters as colour of inner pericarp, colour of vegetative organs, fruit shape, fruit size, leaf size, plant size and number of fruits per plant.

3979 Stevenson, E. C., Tomes, M. L. & Johnson, K. W.
New tomato varieties.
Report, Lafayette, Ind. 1960 : **3** : No. 2 : p. 11.

The varieties Stair [cf. XXIX, 4589] and Tecumseh [XXX, 3301] are described.

3980 Honma, S., Wittwer, S. H. & Heeckt, O.
Spartan Red 8, a new tomato for greenhouse production.
Quart. Bull. Mich. agric. Exp. Sta. 1961 : **43** : 478–81.

Spartan Red 8, a Nebraska 12 x Ohio W–R Globe selection developed at the Michigan Agricultural Experiment Station, is able to set fruit adequately at high temperatures. As compared with Michigan-Ohio Hybrid, the new variety is characterized by an earlier date of maturity, less tendency to cracking, closer spacing of clusters and more uniform ripening. Mature fruits are medium to large, globe-shaped, thick-walled, fleshy and deep scarlet in colour. Spartan Red 8 is susceptible to *Verticillium* wilt, *Fusarium* wilt, *Cladosporium fulvum* and tobacco mosaic virus.

3981 **Manapal is new tomato.**
Crops & Soils 1961 : **13** : No. 5 : p. 19.

Manapal is being released from the University Station, Gainesville, Fla. It is said to be adapted to a wide range of conditions and resistant to several fungal diseases as well as such physiological disorders as cat face, blossom-end rot and grey wall. The fruits are smooth and of good quality.

3982 Menis, J. [Y.].
(Eilon tomatoes).
Sadeh (Field)/Hassadeh 1959 : **39** : 642–44. [Hebrew].

This new tomato variety was selected at the Eilon Settlement, Israel, from material originally introduced in 1951 from California. Eilon matures about ten days later than Marmande and has approximately the same yielding capacity as that variety. Both taste and colour are acceptable. Eilon is resistant to *Fusarium oxysporum* f. *lycopersici*, but is susceptible to *Alternaria* rot and to virus X.

3983 Lambeth, V. N.
The Tomboy tomato.
Res. Bull. Mo. agric. Exp. Sta. 1960 : No. **734** : unpaginated.

Tomboy is the result of breeding to combine the desirable characters of Winsall, which bears large "meaty" fruit, with earliness, better fruit set and wilt resistance in a single variety for the domestic garden. Its pedigree includes Earliana, *Lycopersicon pimpinellifolium* 'Mo. Accession 160', Break o'Day, Bison, Early Stone and Winsall. Mo. Acc. 160 contributed the character of wilt resistance.

3984 Böhme, H. & Scholz, G.
Versuche zur Normalisierung des Phänotypes der Mutante *chloronerva* von *Lycopersicon esculentum* Mill. **(Experiments on the normalization of the phenotype of the mutant *chloronerva* of *L. esculentum* Mill.).**
Kulturpflanze, Berlin 1960 : **8** : 93–109.

This mutant was modified in the direction of the wild type when grafted on to +/+ plants either as the scion or as the rootstock. Whereas the mutant forms no reproductive organs on its own roots, normal fruit developed on the grafted plants. This normalization is reversible, for the chlorophyll defect reappeared in later stages of development. Changes induced by grafting were not inherited. Partial normalization was effected by introducing extracts from +/+ plants into the shoot of the mutant.

3985 Gottschalk, W. & Heide, N.
Über das Auftreten tripolarer Spindeln und mehrkerniger Pollenmutterzellen in abregulierenden polyploiden Pflanzen. **(The occurrence of tripolar spindles and multinuclear pollen mother cells in reducing poyploid plants).**
Z. VererbLehre 1960 : **91** : 27–44.

A small number of PMCs with two or more nuclei were observed in experimentally produced

tetraploids and octoploids of *Lycopersicon esculentum*; these occurred in connexion with premeiotic processes leading to a reduction in chromosome number [cf. XXX, 4414]. In some cases nuclei within a single cell had the same chromosome number and in other cases they differed. In most cases meiosis was synchronous in all the nuclei of a single cell. Tripolar spindles formed in both meiotic divisions of some PMCs; in these cases, nuclei tended to form at telophase with a lower but euploid chromosome number. A possible relationship between reduction in chromosome number and the occurrence of tripolar spindles is discussed.

3986 López, A. P.
Relation of earliness to some plant characters in the tomato.
J. Agric. Univ. PR 1960 : **44** : 236–50.

A study of Earliana, Valiant, Queens and Rutgers at the Isabela Agricultural Experiment Substation, Puerto Rico, indicated that earliness in ripening is associated with (1) high rate of leaf production, (2) small number of leaves from the cotyledons to the position of the first inflorescence on the main stem, (3) relatively large number of leaves from the first to the second and from the second to the third inflorescence on the main stem, (4) development of the first four flower-bearing branches within a relatively small zone of the main stem, (5) relatively thin stem and (6) relatively small leaves.

3987 Leopold, A. C. & Lam, S. L.
A leaf factor influencing tomato earliness.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 543–47.

Evidence has been obtained suggesting that floral inhibition due to the expansion of the young leaves plays a role in determining the time of flowering in late varieties. It is hoped that the concept of leaf growth rate as a factor in earliness may be useful in breeding and in interpreting the effects of climatic conditions upon time of flowering in the later varieties.

3988 Marchesi, G.
Frequenze di fecondazione incrociata naturale nel pomodoro. (**Frequency of natural cross fertilization in tomato**).
Genet. agr. 1960 : **10** : 309–19.

A randomized block at Piacenza comprised 22 cultivars, one of which, Casaque Rouge [Red Jacket], possessed the recessive character potato leaf. Seed from this variety gave rise to progeny containing a certain number of normal seedlings, evidently resulting from cross pollination. The percentage varied from 3·9 to 10·6, being higher in the seedlings from fruits formed later in the season; this is thought to result from the greater frequency of pollinating insects.

3989 Lafon, M. & Manunta, C.
Influenza dell'ambiente e delle differenze razziali sul metabolismo di acidi organici (citrico, malico, succinico) in razze e cultivar di pomodoro, *L. esculentum*, ed altre specie del genere *Lycopersicum*. [**Influence of environment and of varietal differences on the organic acid (citric, malic and succinic) metabolism in races and cultivars of tomato, *L. esculentum* and other species of the genus *Lycopersicum***].
Genet. agr. 1960 : **10** : 265–87.

The results of a series of analyses presented show that in cultivars of both high and low acidity, and in *L. pimpinellifolium*, the principal acid was citric acid; there was a high correlation between acidity and the content of this acid but none with malic or succinic acids. In crosses between *L. pimpinellifolium*, with high acidity, and cultivars of low acidity, the F_1 was intermediate in citric-acid content, with values slightly closer to the lower parent. Succinic acid was more influenced by environment than heredity.
Table varieties had a slightly higher content of malic acid than other types.
The citric-acid content was generally higher in samples from higher elevations.

3990 Manunta, C.
I risultati delle indagini sulle caratteristiche organolettiche e chimiche in cultivar di pomodoro durante le sperimentazioni del 1958–1959. (**The results of investigations on the organoleptic and chemical characteristics of tomato cultivars during experiments in 1958–59**).
Genet. agr. 1960 : **10** : 333–43.

As in previous years, the varieties for peeling had a lower acidity than table or conserving varieties, and F_1 hybrids between forms with low and high acidity had intermediate values, tending more towards the lower than the higher parent. The varieties for peeling had lower contents of ascorbic acid.
Some of the selections made in previous years possessed good colour, flesh consistency, flavour

and aroma, with high sugar content and low acidity.

3991 Foskett, R. L.
Polyembryonic tomatoes, a possible research tool.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 548–54.

Two pairs of twin seedlings were obtained from F_1 seed of German Dwarf Bush x Yellow Plum and Red Jacket x Yellow Plum. All four seedlings contained marker genes from both the ♂ and ♀ parent. The progenies of these plants segregated for the markers. Nine pairs of twin seedlings were discovered in F_2 seed. Seven pairs of the surviving eight were genetically identical with respect to the markers. Chromosome counts were not made, but genetic tests and fertility confirmed the absence of haploidy among the identical twins. Incidence of twinning in Beefsteak was about ten times greater than that in seed lots of other commercial varieties. Beefsteak is noted for its tendency towards fasciation, suggesting that twinning may be associated with this feature. Possibly polyembryony in tomato is largely due to cleavage of the zygote, the cleavage type of polyembryony being an early form of fasciation. Suggestions are made as to the value of identical twin seedlings in genetical and other investigations.

3992 Prashar, D. P. & Lambeth, V. N.
Inheritance of radial fruit cracking in tomatoes.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 530–37.

A detailed account is provided of investigations which have already been briefly reported [2719].

3993 Termohlen, G. P.
De fysiologische specialisatie van *Cladosporium fulvum* en het kweken van tegen de bladvlekkenziekte resistente tomaterassen. **(Physiological specialization of *C. fulvum* and the breeding of leaf-mould resistant tomato varieties).**
Tijdschr. PlZiekt. 1960 : **66** : 314–27.

In this general survey the following work by the author is mentioned. Studies involving varieties carrying the resistance genes Cf_1, Cf_2, Cf_3, Cf_1Cf_2 and Cf_2Cf_3 indicated that races 0, 1, 2, 3, 1.2 and 2.3 occurred in the Netherlands in 1953 and 1954. The expression of the resistance genes was influenced by both environment and genetic background. Nonsporulating mutants produced the same reaction spectrum in the differential varieties as the initial races, but required a shorter period of incubation.

3994 Katan, J. [Y.], Keidar, N. & Wahl, I. [Y.].
(*Fusarium*-resistant tomato varieties).
Sadeh (Field)/Hassadeh 1960 : **40** : 613–16. [Hebrew].

A large number of introduced varieties were tested for resistance to *F. oxysporum* f. *lycopersici* at Rehovot, Israel. Several varieties showed resistance to the pathogen, but were deficient in other respects to standard varieties. A hybridization programme, involving Marmande and Homestead, has now been undertaken.

3995 Stall, R. E.
Development of Fusarium wilt on resistant varieties of tomato caused by a strain different from race 1 isolates of *Fusarium oxysporum* f. *lycopersici*.
Plant Dis. Reptr. 1961 : **45** : 12–15.

Varieties possessing the factor derived from *Lycopersicon pimpinellifolium* 'Acc. 160' for resistance to race 1 of the above pathogen were susceptible to a strain discovered in Florida. Some lines resistant to race 2 were also resistant to the new strain.

3996 D'jačenko, N. N.
(A method for determining the resistance of tomato varieties and hybrids to virus diseases).
Agrobiologija (Agrobiology) 1959 : No. 6 : 912–15. [Russian].

A method developed at Gribovo for testing resistance to streak and mosaic combines sap inoculation with determination of peroxidase activity, a serological test and final visual evaluation of inoculated plants. The F_1 hybrid of Patriot x Antimould and Antimould were the most resistant among the cultivars used in the experiments.

3997 ter Horst, K.
De selectie van peulvruchten in Suriname. I. Inleiding. **(The selection of pulses in Surinam. I. Introduction).**
Euphytica, Wageningen 1960 : **9** : 259–64; and Surinaam. Landb. 1960 : **8** : 7–14.

The desirability of introducing and testing numerous varieties in Surinam with a view to breeding is pointed out.

3998 Picard, J.
Données sur l'amélioration de la féverole de printemps, *Vicia faba* L. (**Contributions to the improvement of the field bean, *V. faba* L.**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1960 : **10** : 121–53.

The extent of cross and self fertilization in 90 populations of *V. faba*, originating from various parts of Europe and North Africa, was investigated. The data obtained confirm that the breeding system falls approximately midway between autogamy and allogamy. The frequency of cross fertilization tends to increase from north to south and from west to east; it is also influenced by genotype and, to a lesser extent, by seasonal variations. Tripping was shown to be essential for successful fertilization in certain lines, while in other lines it appeared to be unnecessary.
Problems related to the choice of a suitable breeding system for improvement of the field bean are discussed. It is suggested that, initially, methods appropriate to autogamous species should be adopted, for the improvement of such characters as disease resistance, seed weight and earliness. Subsequently, cross fertilization is recommended, with a view to the improvement of other yield components such as number of seeds per pod and number of pods per plant.

3999 Kreybig, T.
Untersuchungen über die Wirkung von Ganzkörper- und Teilbestrahlungen auf Jungpflanzen verschiedener Leguminosen. (**Investigations on the effect of total and partial irradiation of young plants of various legumes**).
Diss. Univ. Bonn 1959 : Pp. 77. (Mimeographed).

X irradiation of *Vicia faba* plants at doses above 250 r. led first to a temporary cessation of mitosis in root and stem meristems, then to a resumption of mitosis but with abnormalities of spindle and chromosomes, and finally to total cessation of division. Chromosomes were fragmented at 10,000 r. Dormant buds were also affected by radiation at 250 r. and gave rise to variant leaf forms and to pollen mother cells with injuries resembling those of the meristematic cells. At doses above 250 r., lateral buds failed to develop. Irradiation of single meristems with 1000–2000 r., which is a lethal dose when applied to entire plants, killed the treated organs, but these were replaced by growth of side shoots or roots. The progeny of such plants showed depression of growth and included dwarf plants.
Pisum sativum appeared to be unaffected by entire-plant irradiation at 250 r. and showed gradual cessation of cell division at 1000 r., immediate lethality occurring only at 2000 r. In *Lupinus albus* and *L. angustifolius*, none of the doses used caused more than a few changes in leaf colour. Irradiation caused no alteration in flowering time in any of the species.

4000 Inoue, Y. & Suzuki, Y.
(**On the fertility of the pollen of the broad bean**).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1960 : **29** : 7–11. [Japanese].

The four Japanese varieties studied differed little in pollen germinability. The optimum conditions for pollen germination are a 10% sucrose agar medium and a temperature of 10–20° C.

4001 Ueki, K. & Igawa, M.
(**Ecological differences between broad-bean varieties in response to different day and night temperatures**).
Kagawa Daigaku Nogyobu Gakujutsu Hokoku/Tech. Bull. Fac. Agric. Kagawa Univ. 1959 : **10** : 112–20. [Japanese].

Information is provided on the acceleration in development induced in five Japanese varieties by increased temperature during the day, during the night, or during both.

4002 Henriksen, A.
Sortsforsøg med høje bønner. 1955–58. (**Varietal trials of climbing beans. 1955–58**).
Tidsskr. Planteavl 1960 : **64** : 688–98.

Varietal characteristics and details of performance under Danish conditions are given for ten French beans and three scarlet runners.

4003 Sen, N. K. & Murty, A. S. N.
Inheritance of seed weight in green gram (*Phaseolus aureus* Roxb.).
Genetics 1960 : **45** : 1559–62.

Observations on the F_1s of crosses of the small-seeded variety Sonamung with the medium-seeded BR3 and large-seeded EB6 at the Indian Institute of Technology, Kharagpur, indicated that small seed was more or less completely dominant over the medium and large classes. In the F_2 and F_3, plants with seeds smaller than those of Sonamung were recovered, but none with seeds even as large as those of the larger seeded parent. The F_1s of crosses between two medium parents (BR3 and NP36) and between two large-seeded parents

(EB6 and Brown Fruit) exhibited negative heterosis for seed size. In the F_2s and F_3s of both crosses, segregates with seeds much smaller than those of the small-seeded parent or with seeds larger than those of the larger seeded parent, were recovered. It is suggested that medium and large-seeded varieties of *Ph. aureus* have evolved from small-seeded types through accumulation of additive recessive genes with an effect on seed weight. Since different genes may accumulate in varieties with similar seed weight, the possibility of improving seed weight still further by crosses of different large-seeded varieties is envisaged.

4004 Boling, M., Sander, D. A. & Matlock, R. S.
Mungbean hybridization technique.
Agron. J. 1961 : **53** : 54–55.

Details are given of a modification of Buishand's technique of emasculation and pollination [XXVI, 3915], as used at the Oklahoma Agricultural Experiment Station. A 20% seed set was obtained by means of the method described. Successful crosses included combinations between *Phaseolus aureus* and *Ph. mungo*.

4005 Kedar, N. & Bemis, W. P.
Hybridization between two species of *Phaseolus* separated by physiological and morphological blocks.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 397–402.

Only dwarf seedlings, designated B-dwarfs, were obtained from *Ph. vulgaris* 'Blue Lake' ♀ x *Ph. coccineus* 'Scarlet Runner' ♂. The food supply of the cotyledons was not utilized and the cotyledons did not absciss, the seedlings dying 4–5 weeks after germination. The F_1 of *Ph. vulgaris* 'Tendergreen' ♀ x Scarlet Runner ♂ consisted of another abnormal type (T-dwarf) which, in spite of its reduced vigour, reached flowering stage, the flowers being apparently normal. The plants bore viable pollen, but no seeds were secured as the result of pollination by either the parent species or other T-dwarfs. Crosses of *Ph. vulgaris* 'Light Red Kidney' and 'White Marrow' with Scarlet Runner gave F_1 hybrids closely similar to T-dwarfs. Reciprocal crosses between Blue Lake and Tendergreen resulted in completely normal F_1 plants which, when crossed with *Ph. coccineus*, gave a population consisting of B-dwarfs, T-dwarfs, BT-dwarfs and normals in about equal proportions. BT-dwarfs were similar to the B type but also resembled T-dwarfs in certain characters; they usually died 2–3 weeks after germination. The results indicated that the genes for T and B-dwarfs were inherited independently. Some F_2 plants from Blue Lake x Tendergreen, when test crossed with Scarlet Runner, gave progenies of normals together with B or T-dwarfs, while the progenies of two consisted only of normals. It is suggested that the interspecific barrier resulting in abnormal seedlings may be overcome by using F_1 or F_2 intervarietal hybrids of *Ph. vulgaris* as ♀ parents, and, if they can be discovered, by using genotypes of each species which give normals in the interspecific cross.

4006 Hernández Xolocotzi, E., Miranda Colín, S. & Prywer, Cz.
El origen de *Phaseolus coccineus* L. *darwinianus* Hdz. X. & Miranda C., subspecies nova. (**The origin of *Ph. coccineus* L. *darwinianus* Hdz. X. & Miranda C., subspecies nova**).
Rev. Soc. mexicana Hist. nat. 1959 : **20** : 99–121.

The Anderson technique for the study of introgressive hybridization was applied to *Ph. coccineus* and *Ph. vulgaris* populations collected in Mexico and Guatemala, the chief characters analysed being cotyledon position, peduncle length, inflorescence length, number of internodes in the inflorescence, bracteole shape, stigma position, pod size and shape, seed size and shape, hilum characteristics and root characteristics. The analysis revealed a distinct type intermediate between the two species, differing from *Ph. coccineus* in having epigeal cotyledons, a smaller inflorescence with a higher number of internodes, smaller flowers which are white or purple and a large circular hilum. This form, which occurs in mountainous tropical regions (1500–2500 m.) with a humid temperate climate, shows considerable morphological uniformity and is designated *Ph. coccineus* ssp. *darwinianus*. In areas where the subspecies is absent both parent species show normal meiosis; where it is present, *Ph. coccineus* displays 5–15% chromosome aberrations. The subspecies itself shows 25–50% chromosome aberrations. The origin of the new form by interspecific hybridization as a probable result of local agricultural practices and other factors is discussed and reasons are given for believing it to be of pre-Columbian origin.

4007 Šišković, M.
Stvaranje autotetraploida kod boranije (*Phaseolus vulgaris*). [**The induction of autotetraploidy in the garden bean (*Ph. vulgaris*)**].
Zborn. Rad. biol. Inst. Beograd 1957 : **1** : No. 4 : Pp. 14.

Better results were obtained by treating the growing point with colchicine than by treating

the seed. The flowers, leaves, stomata and pollen grains of the tetraploids ($2n = 44$) were larger than those of the diploids. Also, tetraploid pods were wider and thicker and the seeds larger and heavier than those of the diploids. The vegetative period of the tetraploids was variable and much longer.

4008 Spasojević, S.
Mejozis kod autotetraploidnog pasulja. **(Meiosis in autotetraploid beans).**
Zborn. Rad. biol. Inst., Beograd 1957 : **1** : No. 5 : Pp. 11.

Tetravalents were observed at diacinesis, the number varying between cells of the same plant and between plants; by metaphase I, most of the quadrivalents had split into bivalents. At this stage many univalents were seen and not all the chromosomes were arranged on the metaphase plate. Anaphase I was almost regular but some unequal division of bivalents and some premature movement and lagging of chromosomes occurred. Confluence of the equatorial plates in metaphase II was quite frequent. During telophase I and especially telophase II, individual chromosomes and groups of chromosomes were extruded from the nuclei. The sizes of the pollen grains indicated differences in ploidy. Natural selection is thought to be the most important factor determining the stabilization of autotetraploids in subsequent generations.

4009 Sen, N. K. & Ghosh, A. K.
Studies on the tetraploids of six varieties of green gram.
Proc. nat. Inst. Sci. India 1960 : **26** : Part B : 291–99.

Colchicine treatment of the apical buds of one-week-old seedlings proved to be a satisfactory method of inducing tetraploidy in *Phaseolus aureus*. Marked varietal disparities in the effect of tetraploidy upon several characters were noted. Depending on the variety, yield per plant ranged from 10 to 50% of the diploid. The $4x$ pods were smaller, with fewer but larger seeds. Pollen sterility amounted to 20–30%. At meiosis, the tetraploids formed mostly bivalents, the maximum mean number of quadrivalents per cell being 1·78. Crosses of the tetraploids in both directions with diploids failed. The F_2s of two intervarietal crosses at the $4x$ level each contained a proportion of plants surpassing the diploids in yield, but it remains to be seen whether the yield of the $4x$ form can be increased by selection of this material.

4010 Stojanova, J.
(Investigations on the causes of flower and pod drop in beans).
Nauč. Trud. dobrudž. selskostop. nauč.-izsled. Inst. (Sci. Proc. Dobrudža agric. sci.-res. Inst.) 1959 : **3** : No. 1 : 97–109 : from Zbl. bulg. wiss. Lit. 1960 : **5** : No. 1 : Abst. 115 : 79–80. [Bulgarian]. (Mimeographed).

The variety 221, with a short flowering period, was found to lose less flowers and pods than two other varieties.

4011 Nilsson, L.
Fettfläcksjuka på bönor. En litteratursammanställning och en experimentell undersökning. **(Halo blight disease of French bean. A literature review and an experimental investigation).**
Medd. Växtskyddsanst. Stockh. 1960 : No. 11 : 76 : 376–444.

Details of varietal reaction to *Pseudomonas medicaginis* var. *phaseolicola* in Sweden are included in this study. Among 29 varieties tested, 10 showed a low degree of susceptibility. Large-seeded, luxuriant and late-ripening varieties were the most susceptible.

4012 Caporali, L.
Comportamento dell'*Uromyces appendiculatus* su alcune varietà di fagiolo. **(Behaviour of *U. appendiculatus* on certain varieties of French bean).**
Ann. Fac. Agr., Perugia 1959 : **14** : 57–65.

Studies on the behaviour of the parasite on cultivars differing in resistance are reported; in the most resistant variety, Fagiolo Spagnone media grandezza [Medium-sized Large Spanish bean], the fungal hyphae penetrated the stomata more rapidly than in other varieties but developed more slowly in the tissue. Differences between other varieties were detected in the manner in which the hyphae behaved after penetration.

4013 Walker, J.
Variation in disease reaction within bean (*Phaseolus vulgaris* L.) varieties.
J. Aust. Inst. agric. Sci. 1960 : **26** : 363–66.

Lines of 15 varieties were tested for reaction to inoculation with a single isolate of *Colletotrichum lindemuthianum*. Six of the varieties showed intravarietal variation in reaction. Such variation points to the necessity of using pure-line differentials for the identification of physiological races of the pathogen, and also to the

desirability of use of the same pure lines by different workers so that comparison of results may be strictly valid. The significance of such variation in relation to the problem of varietal identity and to the possibility of selecting for resistance in a variety hitherto regarded as susceptible to a disease is also discussed.

4014 Holle, M. & Pierce, L. C.
Plot technique for field evaluation of earliness, pod number, and total yield in the lima bean.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 403–08.

The following conclusions were reached from a uniformity trial at the Iowa Agricultural Experiment Station, using Henderson Bush.

"The optimum plot sizes for total yield, number of pods and earliness were found to be 15·0 square feet, 26·2 square feet, and 21·4 square feet, respectively. Single row or double row plots were found to be approximately equal in efficiency for number of pods and earliness. A single row plot was required to satisfy the optimum plot requirements for total yield. Earliness data showed low coefficients of variability in all combinations of plot and block dimensions. This indicated that number of days to first flower was a precise measurement of the character. The data further suggested that no replication was required to measure earliness. Extensive replication was found necessary for effective evaluation of total yield and number of pods. Modifications of optimum plot size and replicate number were discussed in terms of Smith's formula."

4015 Saunders, A. R.
Inheritance in the cowpea (*Vigna sinensis* Endb.). III. Mutations and linkages.
S. Afr. J. agric. Sci. 1960 : **3** : 327–47.

The mutant characters of pale-green plant colour and spindly growth habit were inherited independently, each being conditioned by a single recessive gene. The mutant "narrow leaf" was determined by an incompletely dominant gene. In view of this tendency towards dominance of the narrow-leaved condition and the fact that most of the indigenous wild forms of *Vigna* are narrow leaved, it is suggested that this character may in fact be the result of a reverse mutation to an ancestral condition. Mention is also made of three other mutants: crinkly leaf, virescent and a dwarf pale-green type.

Linkages were detected between (1) pale-green plant colour and seed-colour pattern (*W*); (2) spindly growth habit and purple plant colour (*P*); (3) speckled seed coat (*S*) and brown pod (*Y*); (4) hilum-ring pattern and purple pods; (5) the basic colour gene *R* and *U* for mottled seed; (6) black seed coat (*B*) and cerise pod; and (7) grey seed colour and late maturity [cf. 2749].

4016 Saunders, A. R.
Inheritance in the cowpea (*Vigna sinensis* Endb.). IV. Lethal combinations.
S. Afr. J. agric. Sci. 1960 : **3** : 497–515.

Four types of lethal combinations, respectively designated *le a′ .a, le k′ .k, le k″ .k* and *le k′ .k* (*x*), have been identified in intervarietal crosses [4015]. The last three may be identical except for the action of modifiers. The outstanding characteristics of *le a′ .a* were the general brittleness of the tissues and the accumulation of brownish-black material, mainly in the cortex. The majority of the plants died when about six weeks old, but some survived until formation of the first flower buds. In the genotype *le k′ .k*, the first leaves drooped 6–8 days after emergence of the seedlings and soon dropped off, leaving the stem to wither and die. In lethal *le k″ .k*, onset of deterioration and death occurred a few days later than in *le k′ .k*, and the first leaves became somewhat thickened and brittle before falling. It is suggested that *le k″* is merely an alteration, through the action of modifiers, of the expression of *le k′* in combination with *k*. Lethality due to *le k′ .k* (*x*) is described as a "pining" of the plant until almost flowering time, when the plant dies. This condition is thought to be genetically identical with that caused by *le k′ .k*, except for a difference in expression brought about by a modifier, *x*, situated on a chromosome other than the one carrying the lethal genes. No definite evidence was obtained of linkage between any of the lethal genes and those for the more common seed-coat and pod colours [2749]. The data were inadequate for deciding whether the genes in the different combinations were allelic or nonallelic. The possible evolutionary role of such lethal combinations as an isolating mechanism is however discussed. It is suggested that lethal combinations arose before the varieties became geographically separated and that they involve the deleterious interactions of pseudoalleles. It is pointed out that cultivated varieties of cowpea indigenous to the Union of South Africa are not apparently carriers of the lethal genes discovered, whereas the carrier varieties came from widely separated

areas, mostly in tropical or subtropical Africa, where the greatest genetic diversity may be found and where the species may therefore be regarded as having originated.

4017 Pathak, G. N. & Jaimangal Sahai
Type 2—a triple purpose cowpea.
Indian Fmg. 1961 : **10** : No. 10 : p. 25.
Type 2 gives high seed and fodder yields and is also recommended as a green manure crop. Pods are 6–9 in. long with medium-sized seeds.

4018 Strider, D. L.
Control of Cladosporium spot of southern pea.
Plant Dis. Reptr. 1960 : **44** : p. 955.
Of the 18 varieties of *Vigna sinensis* tested for reaction to *Cladosporium vignae* in North Carolina, only Louisiana Purchase and Blue Goose were highly resistant.

4019 Ponnaiya, B. L. X.
D.L. 1428 holds promise of better beans.
Indian Fmg. 1960 : **10** : No. 8 : p. 23.
DL1428, developed in Madras State, combines the bushy habit and drought resistance of *Dolichos lablab* var. *lignosa* with the odourless, fleshy pods of var. *typicus*. If the pods are allowed to ripen they also provide beans of good quality. The hybrid has however the disadvantage of having too long a duration. It has been further crossed with very early strains of var. *lignosa* and, to tone up pod quality, with var. *typicus*.

4020 Marimuthu, K. M. & Subramaniam, M. K.
A haematoxylin squash method for the root tips of *Dolichos lablab* Linn.
Curr. Sci. 1960 : **29** : 482–83.
Details are given of a technique which has proved to be satisfactory for cytological study of *D. lablab* which has small chromosomes. The chromosome number was found to be $2n = 22$, in contrast to $2n = 24$ as reported by some investigators. A pair of satellited chromosomes was noted. The technique has also given good results with pea, onion, *Phaseolus radiatus* and *Cicer arietinum*.

4021 Sen, N. K. & Vidyabhushan, R. V.
Studies on the induced polyploids of horse gram.
Indian J. Genet. 1960 : **20** : 212–22.
Attempts were made to induce polyploidy in three early and four late varieties by colchicine treatment of the seeds and of apical buds of 1-week-old seedlings. Seed treatment was not successful but treatment of apical buds resulted in the development of polyploid sectors in the young plants; pure tetraploids were obtained from these in the following generation. Diploid and tetraploid seeds germinated at about the same time and germination percentage in the tetraploids was equal to or slightly below that of the diploids according to variety. The tetraploids were slow-growing initially but eventually surpassed the diploids; they produced fewer but thicker stems and had larger flowers. Flowering was delayed in the tetraploids but this was less marked in the late varieties; the length of the flowering period was increased in all varieties by 4–6 weeks. While the tetraploids produced a large number of pods, these were smaller than in the diploids and contained fewer seeds. Since pollen fertility was high (80–90%), it is suggested that the reduced seed setting may be due to zygotic sterility. A number of aneuploids appeared in the progeny of selfed tetraploids.

4022 Mitrović, A.
Prilog proučavanju bioloških osobina i proizvodnih vrednosti soje na području Južnog Banata. (**A contribution to the study of the biological characters and economic value of the soya bean in the southern Banat region**).
Arh. poljopr. Nauk. 1960 : **13** : No. 39 : 34–45.
In trials conducted at Pančevo, the highest yielding varieties were Domáca [Local] from Pančevo, Lincoln, Hawkeye and Szürkebarát [Grey Friar].

4023 Budišić, M.
Pitanje sorti soje u Slavoniji. (**Testing of soya-bean varieties in Slavonia**).
Savremen. Poljopr., Novi Sad 1959 : **7** : 690–95.
In trials conducted at the Institute of Agricultural Advancement, Osijek, between 1954 and 1958, the outstanding varieties were Dicksman-Grüngelbe [Dicksman Greenish-Yellow], Manchu-Hudson and Manchu-Wisconsin.

4024 **Rebel soybean, new variety for the south.**
Crops & Soils 1960 : **13** : No. 3 : p. 19.
Developed by a commercial company, Rebel is a medium to late-maturing variety suitable for cultivation in the southern United States. In 1959 yield trials in Mississippi, it performed as well as Hood, Lee, Ogden and Jackson. Although somewhat susceptible to lodging under

certain conditions, Rebel has an upright growth habit and nonshattering pods and thus yields are not seriously reduced by lodging. In appearance, Rebel is similar to Lee.

4025 **Best soybean varieties.**
Soybean Dig. 1961 : **21** : No. 4 : 14–17.
Leading soybean varieties.
Ibid. 1961 : **21** : No. 4 : 18, 21.
Varietal recommendations are given for the various soya-bean growing states in the USA, together with a varietal map. The second article provides information on the characteristics of 39 widely cultivated varieties in the USA.

4026 Probst, A. H. & Athow, K.
Kent, a high yielder.
Soybean Dig. 1961 : **21** : No. 4 : p. 22.

Probst, A. H. & Athow, K.
Kent is new high-yielding soybean variety.
Crops & Soils 1961 : **13** : No. 5 : p. 19.
Compared with Clark, the soya-bean variety Kent (Lincoln x Ogden) has given especially high yields in its areas of adaptation in Delaware, Maryland, Indiana and Illinois. Resistant to lodging and high in oil content (21·9%), it is similar to Clark in growth type and height, but about nine days later in maturity. It bears yellow seeds, with a black hilum. Kent is resistant to some races of *Peronospora manshurica* and to *Cercospora sojina*.

4027 Zabaznyj, P. A.
(More attention to cultivation of soya bean).
Hlopkovodstvo (Cotton Growing) 1959 : No. 11 : 72–78. [Russian].
Some Soviet standard varieties are listed together with the districts for which they are recommended. They include two new varieties, one from Kirovograd and the other from the All-Union Soya-bean and Castor-oil-plant Institute [VNIISK]. Both are suitable for combine harvesting and one of them, VNIISK4, produces beans which have 24% of oil and 40% of protein.

4028 Dunleavy, J. M., Weber, C. R. & Chamberlain, D. W.
A source of bacterial blight resistance for soybeans.
Proc. Ia. Acad. Sci. 1960 : **67** : 120–25.
Field and laboratory tests conducted at Ames, Iowa, between 1957–59 showed that PI68708, an introduction from Harbin, Manchuria, is resistant to *Pseudomonas glycinea* and to brown spot (*Septoria glycines*). It is however susceptible to *Phytophthora* rot and to race 8 of *Peronospora manshurica*. Yield, date of maturity, seed size and quality and lodging resistance of the introduction are comparable to the same characters in Blackhawk.

4029 Crittenden, H. W., Springer, F. B. (Jun.) & Cole, R. H.
Bethel.
Soybean Dig. 1961 : **21** : No. 4 : 22, 24.
The soya-bean variety Bethel (Perry x FC33243) is resistant to *Meloidogyne incognita acrita*, a characteristic derived from the second parent, and is adapted to those areas in Delaware, Maryland and Virginia where this pest constitutes a problem. It is also resistant to *Diaporthe phaseolorum* var. *sojae* and *Cercospora sojina*. On a dry-weight basis, its oil and protein contents have averaged 21·0% and 41·6%, respectively. Of the commercial varieties in the same maturity group, Bethel has the highest protein content. Yellow seeded, with a yellow hilum, it ripens 6–10 days later than Wabash and Clark and 4–8 days before Dorman and Hill.

4030 Sen, N. K. & Vidyabhusan, R. V.
Tetraploid soybeans.
Euphytica, Wageningen 1960 : **9** : 317–22.
Compared with the corresponding diploids, colchicine-induced tetraploids of Kharagpur and IC198 studied at the Institute of Technology, Kharagpur, India, showed (1) lower germination percentage, due to reduced imbibition, (2) fewer branches, (3) enlarged leaves, floral parts, fruits and seeds and (4) a reduced number of fruits and seeds/fruit. The tetraploids were equal or superior to the diploids in plant height, the difference varying according to variety and season. The frequencies of metaphase I configurations in the tetraploids were $9{\cdot}9_{IV} + 1{\cdot}85_{III} + 14{\cdot}9_{II} + 5{\cdot}2_{I}$ per cell. The maximum number of quadrivalents observed was 17. The progenies of the tetraploids were fairly uniform, with 1–3% abnormal plants.

4031 Williams, J. H. & Hanway, D. G.
Genetic variation in oil and protein content of soybeans induced by seed irradiation.
Crop Sci. 1961 : **1** : 34–36.
Oil and protein percentages were determined in seed harvested from the irradiated materia used in a previous study [cf. XXIX, 2056]

Estimates of genetic variance for oil and protein percentages were six or more times as great in the irradiated populations as in the controls. Heritability estimates for oil and protein content were five and ten times as great respectively as in the control populations.

4032 Ronde groene erwten, 1961. (**Round blue peas, 1961**).
Landbouwvoorlichting 1961 : **18** : Bijl. 78; Ber. Rassenkeuze No. 295 : Pp. 3.
Yield data are given for nine varieties tested on different soil types in the Netherlands since 1950. WPH333, recently admitted to the varietal list, is productive on heavy clay soils and shows little susceptibility to top yellows.

4033 Rod, J. & Andonov, I.
Příspěvek k vývojové charakteristice některých domácích odrůd hrachů. (**A contribution to the developmental characteristics of some native varieties of pea**).
Věd. Prác. výzkumn. Ústav. Krmivářsk. ČSAZV Pohořelicích 1960 : **4** : 105–20.
The reactions of five Czech varieties of garden pea and three varieties of field pea to changes in photoperiod were studied. The late-ripening varieties were most susceptible to photoperiod and their development was more accelerated by lengthening the photoperiod than that of the early varieties. Weather conditions had more effect on the early varieties. The late varieties were most suitable for summer cultivation in mixtures.

4034 Bar-Droma, M.
(**What determines the yield of peas ?**)
Sadeh (Field)/Hassadeh 1959 : **40** : 145–47. [Hebrew].
Yield in peas is a function of the number of plants per acre, the number of pods per plant and the 1000-seed weight. It is thought that yields could be increased by stimulating the main branches of the plant. Studies showed that this could often be effectively accomplished by increasing the space allotted to individual plants. A number of varieties are classified according to their branching capability, as follows: very low, Alaska and Avanti [Forward]; moderate, Perfection, Nitshon [Victory], Pinto, Erika, Serbo and Julia; high, Lincoln, Avni, Celsior and Wando; and very high, Rondo, Vares and Yonika.

4035 Clauss, E.
Die phenolischen Inhaltsstoffe der Samenschalen von *Pisum sativum* L. und ihre Bedeutung für die Resistenz gegen die Erreger der Fusskrankheit. (**Phenolic compounds in the testas of *P. sativum* L. and their importance with regard to resistance to the causal agents of foot-rot disease**).
Naturwissenschaften 1961 : **48** : p. 106.
It has previously been shown that the resistance of varieties with coloured flowers to the foot-rot fungi *Ascochyta pisi, A. pinodella* and *Mycosphaerella pinodes* is associated with the presence of tannin-like substances related to anthocyanins in the testa. The present studies show that (*a*) testas of such varieties contain more than 10% (dry weight) of phenolic substances, mostly leucoanthocyanins and (*b*) isolated leucodelphinidin added to a decoction of testas of the highly susceptible variety Kelvedon Wonder caused a marked reduction in pycnidial production and mycelial growth of *M. pinodes* cultured in the decoction.
Varieties with red-violet flowers had delphinidin, petunidin and malvidin in the flowers and leucodelphinidin with traces of leucoanthocyanidin in the testas, while varieties with pink or light-red flowers have cyanidin, paeonidin and occasionally traces of pelargonidin in the flowers and only leucocyanidin in the testas.

4036 Snyder, W. C. & Alexander, J. V.
Perfect stages of *Fusarium oxysporum* and of *Fusarium solani* f. *pisi* still unknown.
Nature, Lond. 1961 : **189** : p. 596.
It is concluded, from experimental evidence, that the *Hypomyces* (= *Nectria*) reported by Buxton [XXX, 2090] is not the perfect stage of *F. oxysporum* f. *pisi*, nor, as postulated by Gordon, the perfect stage of *F. solani* f. *pisi*. The writers suggest that the isolate is a homothallic, saprophytic fungus whose imperfect stage is some other form of *F. solani*.

4037 Malinina, E. E. & Livanov, K. V.
(**Tall varieties of chickpea**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 48–51. [Russian].
An account of breeding chickpea at Krasnyj Kut, together with descriptions of new varieties, most of them tall bush types suitable for combine harvesting, is given. Jubilejnyj [Jubilee] is characterized by drought resistance,

quick initial growth and taller habit and higher seed yield than Krasnyj Kut 195. So far it has shown resistance to *Ascochyta*. Skorospelka [Early] is early and outstandingly productive under drought conditions. Zolotoj [Golden], which outyields all the new hybrid varieties, and two ultra-early varieties with high quality seed, Severnyj 1 [Northern 1] and Severnyj 2, have reached advanced trial stages.

4038 Gooding, H. J.
Some problems of pigeon pea improvement.
J. agric. Soc. Trin. Tobago 1960 : **60** : 321–38.

"Previous investigations at the I.C.T.A. [Imperial College of Tropical Agriculture] on pigeon peas are reviewed in so far as they relate to present research. The aims of the present improvement programme are to obtain determinate bearing, early maturing dwarf cultivars of acceptable yields.

"A time of planting experiment is described which illustrates the great effect sowing date has on periods to flowering and height of bushes. The selections examined fall into two groups, those which are strongly affected by sowing date and those which are not. It is shown that flowering can be inhibited in two early dwarfs by long-day treatment."

[Author's summary].

4039 Laughnan, J. R.
Super sweet, a product of mutation breeding in corn.
Seed World 1961 : **88** : No. 1 : 18–19.

"Super sweet" sweet corn, developed at the University of Illinois, carries the single recessive mutation sh_2 on chromosome 3. In sh_2 kernels, the total sugar content and sucrose percentage are much higher than in the kernels of the usual sugary (*su*) type. Super sweet kernels are less subject to loss of sugars after harvesting because of their lower content of dextrins. This type may therefore lend itself to the production of double hybrids, since uniformity in time of reaching the prime stage, attained in ordinary sweet corn by use of single crosses, would be less important. Super sweet counterparts of the lines of both Golden Cross and Iochief hybrids have been developed. The kernels of super sweet hybrids are considered to be sweeter, plumper, more crisp and better flavoured than those of *su* sweet corn. The sh_2 hybrids have shown good quality for freezing and canning. In the case of canning, addition of sugar to the pack is unnecessary.

4040 Sacklin, J. A., Kyle, J. H. & Wolford, E. R.
Evaluating new sweet corn varieties.
Proc. Amer. Soc. hort. Sci. 1960 : **76** : 436–41.

A study of 13 hybrids grown for two seasons in Washington State indicated that refractometer measurement of soluble solids was an effective method of predicting moisture content. A single regression line of moisture content on soluble-solids content could be used to predict the maturity of all 13 hybrids. The method facilitates harvesting of samples with similar maturity, and thus direct comparison of hybrids with respect to agronomic and processing qualities.

4041 Thomas, W. I. & Eldredge, J. C.
Simultaneous conversion of inbred lines of popcorn to cytoplasmic male sterility and pollen restoration.
Agron. J. 1960 : **52** : 716–17.

Fourteen popcorn inbreds were simultaneously converted during the course of six back crosses to cytoplasmic male sterility and fertility restoration by Eckhardt's system [XXIV, 159]. Pollen-restoring capacity of the converted lines was evaluated by means of (1) selfed progenies derived from two fertile plants in each segregating row of each of the 14 lines, (2) outcrosses of these two fertile plants in each row to a male-sterile individual in the same row and (3) backcross progenies of fertile plants pollinated by the recurrent nonrestoring inbreds. From the data on segregation for fertility, it was concluded that Eckhardt's method may be considered as adequate under most circumstances, especially if no genetical or other study is desired in the conversion of standard lines.

4042 Admiral'skaja, S. A.
(New initial material for breeding peppermint).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1959 : No. 6 : 66-67. [Russian].

A fertile allopolyploid of *Mentha piperita* was obtained by colchicine treatment of a plant rich in essential oil which had been previously selected from a common Soviet strain. The sexual progeny comprised mostly seedlings resembling the allopolyploid form, the remaining ones having the morphological characteristics of *M. sylvestris* or the initial strain. Among selected seedlings of the first kind was 7·1 (13)–25, which yields 36% more essential oil than Priluki 6 [cf. XXX, 2398].

4043 Joshi, A. B.
These new spices will pay you well.
Indian Fmg. 1961 : **10** : No. 10 : 26–28.
New varieties of *Trachyspermum ammi*, coriander, cumin, fennel and dill (*Anethum sowa*) are listed. The varieties were selected at the Indian Agricultural Research Institute, New Delhi.

4044 Krickl, M.
Wurzelpetersilie. Wurzeltypen und deren züchterische Auslesen. (**Root parsley. Root types and their selection for breeding**).
Mitt. Klosterneuburg : Ser. B 1960 : **10** : 5–18.
Much variation in root form has been found and several types are described. Selection for a single root tapering evenly to the tip is being carried out, this type being suitable for mechanical harvesting. Also it has been found that the outer nonfibrous layer of the root can be increased in size by selection. Most of the plants examined gave a good crop of seed.

ECONOMIC LOWER PLANTS

4045 Steigler, A. K.
Gross-Mutationen bei Mikroorganismen. (**Macromutations in microorganisms**).
Naturwissenschaften 1960 : **47** : 452–53.
As a result of X irradiation, alone or together with other treatments, mutants for colony form, spore colour and the formation of soluble pigments have been obtained in *Streptomyces*. In addition, mutagenic irradiation in the presence of DNA or DNA fractions *in statu nascendi* has given rise with some regularity to forms differing both morphologically and physiologically from the initial strain and containing new types of antibiotic substances.

4046 James, A. P.
The spectrum of severity of mutant effects. II. Heterozygous effects in yeast.
Genetics 1960 : **45** : 1627–48.
"Dominance in each of an array of mutant genes affecting a quantitative character was investigated in yeast. The character used was rate of growth. Mutations were of both X-ray-induced and spontaneous origin. Their effects on the haploid varied from lethal to positive. The smallest measured effects were reductions of 3·5 percent.
"The mean effect of recessive lethals and near-lethals on growth rate of heterozygotes was a reduction of eight percent. The modal value of these heterozygotes was within two percent of normal. The mean effect of nonlethal but negative mutations on heterozygotes was a reduction of 0·6 percent. The modal value approached normal.
"There was little evidence of overdominance. Significant increases in rates of growth, interpretable in terms of overdominance but not assuredly such, were found in three of 69 heterozygotes for negative mutations.
"Direct evidence of a negative correlation between mutant effect in the haploid (considered to be equivalent to the homozygote) and in the heterozygote was found; mean dominance was greater for mutations of small effect than for mutations of large effect." [Cf. XXX, 2115, 4495]. [Author's summary].

4047 Sherman, F.
The effects of elevated temperatures on yeast II. Induction of respiratory-deficient mutants.
J. cell. comp. Physiol. 1959 : **54** : 37–52.
"Vegetative petite" mutants were induced in five strains of *Saccharomyces cerevisiae* by subjecting cultures to temperatures higher than the normal 30° C.

4048 Sarachek, A.
The induction by Mn^{++} of heritable respiratory deficiency in nondividing populations of *Saccharomyces*.
Biochim. biophys. Acta 1959 : **33** : 227–30.
The ability of Mn^{++} to induce heritable respiratory deficiency in nondividing cells of *S. cerevisiae* was demonstrated. Mn^{++} has both mutagenic and toxic properties, but under certain conditions, the two properties can be dissociated. Thus, when cells not depleted of aminoacids were incubated for 24 hr. in the presence of $4{\cdot}10^{-3}$ M Mn^{++} and $5{\cdot}10^{-4}$M Mg^{++}, there was an approximately 70-fold increase in the frequency of respiratory variants with no corresponding decrease in cell survival. It is suggested that Mn^{++} induces respiratory deficiency in *Saccharomyces* by inducing abnormal protein synthesis, resulting in the decay of one or more essential physiological systems.

4049 Thyagarajan, T. R.
The reaction of the nuclei of the vegetative cells and zygotes of *Saccharomyces carlsbergensis* to some staining techniques.
Proc. Indian Acad. Sci. : Sect. B : 1961 : **53** : 42–48.
Vegetative cells and zygotes were fixed in iodine formaldehyde acetic acid solution and, after

acid hydrolysis, stained by the hematoxylin, Feulgen and Giemsa techniques. As revealed by the three methods, the size and orientation of the structures in the nuclear matrix in relation to the nuclear membrane closely corresponded. All the structures visible in living nuclei were stainable with hematoxylin. Not all intranuclear structures were Feulgen positive. It was therefore concluded that the nucleus includes chromocentres, as well as nucleoli.

4050 Spoerl, E., Nields, H. W. & Plisich, J. J.
An X-ray induced block preventing cell degeneration and accompanying an inhibition of cell division in yeast.
J. cell. comp. Physiol. 1960 : **56** : 55–65.

"Growing yeast cells given a low dose of X-radiation adequate to inhibit cell division were found, after a period of starvation, to be more viable, more capable of taking up P^{32} and oxygen and of producing carbon dioxide than were unirradiated cells. The possibility was discussed, that the action of radiation was somehow to stabilize the cell membrane or a component structure and thus preserve these capacities through the period of starvation as well as prevent a loss of phosphorus and nitrogen compounds such as occurred from unirradiated cells. The starvation responses occurred in young cells but not in old cells. Additionally, a reduced potassium retentivity and rate of endogenous respiration were observed immediately after irradiation."

[Authors' summary].

BOOK REVIEWS

4051 Loutit, J. F. & Scott Russell, R. (Editors).
Progress in nuclear energy. Series VI. Biological Sciences. Volume 3.
Pergamon Press, Ltd., London 1961 : 45s. : Pp. vii + 154 + xii : 39 figs. : 71 tables.

Discussions of the role of natural radiation in the induction of mutations and hence as a factor in evolution often centre on the extent to which it is absorbed into the organism and particularly into the tissues of the reproductive organs. More recently similar questions have arisen in connexion with artificial radiation and the fission products from atomic explosions. Some of the answers are provided by the studies reported in this volume. The first deals with Physical characteristics of fallout and its retention on herbage by R. Scott Russell and J. V. Possingham. Experiments are described in which plants of *Lolium perenne* and *Trifolium repens* growing in boxes, as well as various native Australian plants such as *Atriplex* sp., *Erodium* sp., *Danthonia* sp. and *Stipa* sp., were examined after exposure to a nuclear detonation. There was wide variation in retention of fission products but no significant differences between individual species could be detected, though retention was lower in clover than in grass species. The results show that the fall-out is relatively soluble and much more available for absorption by plants and animals than had previously been supposed.

L. J. Middleton, R. Scott Russell and E. N. Greer report on The retention of fallout on cereals ripe for harvest. Sheaves of ripe wheat exposed to the same detonation were analysed and it was found that 90% of the total activity was contained in the chaff and very little in the grain.

Other contributions deal with the distribution of fission products in various animals after the detonation. The editors contribute a chapter on general conclusions.

4052 Müntzing, A.
Genetic research. A survey of methods and main results.
LTs Förlag, Stockholm 1961 : £2 10s. : Pp. 345 : 213 figs. : tables.

This book, of which two Swedish editions [cf. XXV, p. 100, and XXX, 3363] and one German edition [cf. XXVIII, 2416] have already been published, now appears in an English translation of the Swedish edition of 1960. The translation, made by the author and revised by C. Montagu-Evans and L. Eyre, is generally accurate and readable, despite occasional un-English turns of phrase and expressions such as "exterior part" of a chromosome (p. 115) for "distal end" and "nativity" (p. 315) for "birth rate". The list of references has been expanded by the addition of further works in English and German, and some Scandinavian publications have been omitted.

4053 Le Roy, H. L.
Statistische Methoden der Populationsgenetik. (**Statistical methods in population genetics**).
Birkhäuser Verlag, Basel and Stuttgart 1960 : SFr. 67.50 : Pp. 397 : 65 figs. : 89 tables.

For many years population genetics was the exclusive preserve of English-speaking authors. Recently, however, contributions have begun to appear in other languages, notably those of Sakai and Kimura in Japanese. It is noteworthy that German-speaking writers have shown relatively little interest in this field. In part, this disinterest may have resulted from the aloof attitude of Central European investigators to the statistical methods developed in England and America, and it has only been comparatively recently that adequate text books of mathematical statistics have been published in German [cf. XXV, p. 261 and XXXI, 2814]. The two text books just referred to were Swiss publications and it is significant that the present volume is also Swiss, brought out by the same firm as the others.

The author is Professor of Biometry and Population Genetics at the Technical High School, Zürich, having previously spent a year at the Institute of Animal Breeding, Iowa State College. The book is written at a merciless mathematical level and presupposes a thorough knowledge of statistics and matrix algebra and a fair knowledge of genetics. The first section deals with first principles, genetic and environmental effects, breeding systems, number of alleles per locus, multiple genes, dominance and epistasis. Perhaps rather more attention is paid here than is usual to analysis of environmental effects. The next section is devoted to genetic and genetic-environmental correlations and to the method of path coefficients. In the third section, analysis of variance and regression analysis are introduced, and in the last section artificial selection and progeny testing are treated.

Throughout the book, the major preoccupation of the author is with animal breeding. Occasionally, however, plants are considered, as in section 26 on partitioning of variance and in section 34, where mass selection, recurrent selection and reciprocal recurrent selection are discussed. While the subjects chosen are dealt with exhaustively, many topics customarily dealt with in treatises on population genetics are virtually omitted, in particular, small-population effects, approach to equilibrium under various mating systems, and the effects of linkage, mutation and migration.

There is a 31-page bibliography, just over two pages of which deal with plant breeding. The final challenge to the reader is a two-dimensional subject index.

4054 Cameron, T. W. M. (Editor).
Evolution: its science and doctrine.
Toronto University Press and Oxford University Press, London 1960 : 40s. : Pp. xi + 242 : figs. : table.

In June 1959 the Royal Society of Canada organized a symposium on evolution in commemoration of the centenary of the publication of the *Origin of Species*. The papers presented are reproduced in this volume. It starts with a rather idealized account, by L. S. Russell, of the evidence in favour of evolution derived from the fossil record, much emphasis being placed on the polyphyletic origin of most of the groups in the animal kingdom. Other contributions follow on the Lower Cambrian fauna, on evolution of paleozoic life, evolution of dental patterns in the lower vertebrates, fossil mammals and intercontinental connexions, and southern intercontinental connexions and the origin of the southern mammals; this last contribution assembles evidence for the existence of early land connexions between South America, southern Africa, Antarctica and possibly Australia. W. P. Thompson, on The cause and mode of evolution, outlines briefly the contributions of genetics to an understanding of the origin of variation and the operation of natural selection, concluding that "the theory of natural selection, as set out by Darwin in the *Origin of Species*, extended and modified by these advances, constitutes a satisfactory explanation of the cause and mode of evolution".

M. J. Dunbar spoke on natural selection in establishing stability in ecosystems. D. B. O. Savile, in The evolutionary significance of barrier penetration, illustrates on the basis of the Saxifragaceae the bursts of speciation that may occur when a population penetrates into a new area by crossing some barrier such as Beringia, another example being the evolution of the Basidiomycetes after the change from dispersal of spores in water to dispersal by air currents. Á. Löve, in Biosystematics and the processes of speciation, affirms that the species is "the most real of the lower taxonomic categories", reproductive isolation being regarded as the main criterion of distinction. In The evolution of bacteria, R. G. E. Murray points to features of composition and structure

that suggest that the bacteria and the blue-green algae form a natural group distinct from other organisms. Some special features of bacterial genetics are referred to and wonder is expressed at their evolutionary stability. Phenomena of symbiosis are illustrated by brief reference to *Rhizobium* and bacteriophages. B. F. Crocker, a biochemist looking at evolution, cites the community of all organisms in respect of certain basic metabolites, such as DNA and ATP, as evidence in favour of evolution. Many enzymatic and other responses are mentioned which cannot be regarded as adaptive or purposeful and it is suggested that "each cell produces a large number of proteins and other products only a small fraction of which are essential to survival or even active at all physiologically". L.-M. Régis, speaking on Quelques réflexions philosophiques sur la science de l'évolution [Some philosophical reflections on the science of evolution], attempts to show that orthogenesis can be viewed as something which, though improbable, is no more so than the origin of life itself. Its inner meaning is just as obscure, though not necessarily more so. More improbable, and hence less intelligible, is the permanency of many types of organism throughout geological time, since the essence of matter, inorganic and organic, is seen as its diversity, which is thought to have reached its culmination in the human spirit.

The remaining contributions are devoted to rather more general aspects of the influence of the evolutionary idea: its effect on political and social thought, on Samuel Butler, on the utilization of natural resources in industry, on physics and on cosmology. The final contribution, by A. G. W. Cameron, is on the origin of the elements, which is envisaged as occurring cyclically by a process in which nuclei either gain mass or lose it according to the temperature and pressure occurring in a given star.

4055 Bourne, G. H. & Danielli, J. F. (Editors).
International review of cytology. Vol. 10.
Academic Press, New York and London : 1960 : $13.00 : Pp. xiv + 409 : figs. : tables : plates.

The tenth volume [cf. 2821] begins with a review of the chemistry of Schiff's reagent, which includes a section on the applications of the reagent in cytochemistry. The second review is on Spontaneous and chemically induced chromosome breaks, by Arun Kumar Sharma and Archana Sharma, and starts with a consideration of the mutagenic effects of various plant metabolites such as those produced in aging seeds; next to be considered are the effects of such factors as temperature, water and the dyes used in the preparations, some of which may be mistaken for the effects of the treatment. A review is then given of published work on the action of a variety of chemicals in producing chromosome breaks, the first to be dealt with being naturally the alkaloids; others include various pigments, many of them studied in the authors' own laboratory, coumarin derivatives, vegetable oils and essences, drugs and antibiotics, growth substances, mustards and phenols. The list is so great and so diverse that the conclusion is reached that different groups of chemicals may act in different ways, some affecting the nucleic acid bases, some the sugars and some the acid and so on.

S. Wischnitzer writes on The ultrastructure of the nucleus and nucleocytoplasmic relations, giving a review of what is known on the structure of the nuclear envelope, the nucleolus, the chromosomes at their various phases and the nucleoplasm. Progress has not, we are told, been comparable to that reported for the cytosomal constituents. Nevertheless, the studies have confirmed the bilamellar structure of the nuclear envelope, which seems to be a specialized portion of the endoplasmic reticulum and to possess discontinuities which would permit the exchange of materials. A microfibrillar organization has been established for some but not, it seems, for all chromosomes and there is no evidence for the existence of a limiting membrane around the chromosome.

Other reviews in this volume deal with the mechanism of cleavage, the growth of liver in mammals, the affinity of carcinogenic dyes for cytoplasmic components, and epidermal cells in culture.

4056 Brachet, J. & Mirsky, A. E. (Editors).
The cell: biochemistry, physiology, morphology. Vol. IV.
Academic Press, New York and London 1960 : 128s. 6d. : Pp. xv + 511 : figs. : tables.

The fourth volume of this five-volume work on the cell [cf. XXIX, 3304] begins with a chapter by R. Thomas on viruses; "rather pure nucleic acid preparations" are referred to as the "isolated genetic material" of the virus, and the reader is warned of the difficulty in distinguishing some viral forms from normal cell

constituents. The properties of virus particles and their multiplication are described in some detail, particularly those of the bacterial viruses, which have been most intensively studied. There are explanations of the phenomena of lysogeny, colicinogeny, conversion, transduction and transformation. All the information presented points to profound similarities in the fundamental behaviour of viral material and of the cellular components of similar chemical composition.

Chapter 2 deals with the visible organization of bacteria. Accounts are given of the properties of the cell wall, plasma membrane and cytoplasm in bacteria of different types. One interesting point that emerges is the suggestion of homology between the plasma membrane and the mitochondria; the latter being absent in the bacteria, their functions seem to be assumed by the plasma membrane. Though the term nucleus is employed for convenience, the author of this chapter, C. F. Robinow, declares a definite preference for more guarded expressions such as "chromatin bodies" or "chromatin", implying merely "something that probably performs some of the functions of a nucleus but about whose organization and behavior during division we are still largely in the dark". Studies on living material, having shown that the chromatin undergoes a change in fine structure before division, are said to "raise the hope that the division of at least some bacterial nuclei will soon become intelligible in terms of the behavior of their constituent elements". The phenomena of transformation, transduction and conjugation are referred to briefly. It has not, we are told, been shown that the "nucleus" takes part in conjugation and the possibility is not excluded that the 10% of paternal DNA that goes into the zygote may come from a different, as yet unrecognized, source.

In a chapter on intracellular parasitism and symbiosis, W. Trager describes a large range of organisms that exist as intracellular parasites, some of them being useful, some harmful and others exerting no apparent effect on the host organism; the *K* particles are included in this last class, and the first class contains some curious examples such as algae living in giant clams and yeasts in insects, supplying them with essential growth substances, as well as more familiar ones such as mycorrhiza and rhizobia. Reference is made to the biological strains that have been discovered in the rhizobial bacteria; when the right strain is present, leghemoglobin is formed, though neither host nor bacterium form it independently, and nitrogen fixation occurs. The final opinion expressed is that further progress in this field of study may prove fundamental to a complete understanding of what goes on in a living cell. Other chapters in the volume deal with protozoa, the neuron, photoreceptor structures and muscle cells.

4057 Davies, D. D.
Intermediary metabolism in plants.
Cambridge University Press 1961 : 20s. : Pp. xii + 107 : 35 figs. : 10 tables.

The volume under review is based on a course of lectures to honours botany students. In the first chapter evidence of stereospecificity in various enzyme-controlled reactions is cited and in chapter 2 the organization and structure of enzymes are examined in the light of this specificity, which results from the asymmetry of the enzyme surface. "The influence of structure on function is to be found at all levels of biological organisation, ranging from the transmission of genetic information by a coding system based on the nucleotide sequence in nucleic acid, to the adaptations of form which are studied by comparative anatomists." The role of microsomes and mitochondria is examined, together with the evidence for the arrangement of the enzymes within such organelles in an ordered sequence.

Chapter 3 is devoted to bioenergetics, special consideration being given to the electron-transporting system in the mitochondria, and chapter 4 deals with the metabolism of carbohydrates and fats and with the Krebs cycle; evidence is cited suggesting that the process of fatty-acid oxidation is similar in plants and animals, a form of β-oxidation being involved; common possession of the Krebs cycle is thought probable but in this connexion more reservations are expressed. Synthesis of carbohydrates and fats is considered in chapter 5 and links in metabolic pathways in chapter 6; a number of the intermediates in carbohydrate metabolism being also intermediates in aminoacid metabolism, various possible interrelationships between the two are examined, certain limitations of interpretations involving kinetic systems being pointed out.

In summing up in the final chapter, similarities and differences in the enzyme systems of different groups of organisms are put into a phylogenetic perspective and some speculations are made regarding the role of secondary plant products.

4058 Parsons, F. T.
How to know the ferns.
Dover Publications Inc., New York 1961 : $1.25 : Pp. xiv + 215 : 11 figs. : 42 plates.

A good key, adequate descriptions and clear drawings with an indication of scale are the prime requisites for any illustrated handbook of botanical identification; in addition, if the book is to be anything more than a list from which the species may be ticked off one by one as the user identifies them, an outline of taxonomic principles and the relationships of genera and families is desirable, together with up-to-date scientific nomenclature. This charming little book, first issued in 1899, and described by the publishers as "a modern classic of nature law", falls short on all counts. The "key" to the 57 species is just a list of descriptions arranged under six main groups separated according to position of sori or sporangia; the descriptions are bare; and too many of the illustrations are simply pretty decorations in which shadowy fronds trail in elegant curves around the edges of the text.

Nevertheless, this is not a useless book. Miss Parsons was an enthusiast and could communicate enthusiasm. She had a genuine delight in wild plants and her observation was good; and her descriptions of fern habitats and their changing appearance during the course of the year are thus more vivid than those found in otherwise more informative texts. The beginner will probably find this a stimulating volume; but unless he can supplement its pleasures with information from other sources, he will remain a beginner for ever.

4059 Stiles, W.
Trace elements in plants.
Cambridge University Press 1961 : 3rd Ed. : 40s. : Pp. xiv. + 249 : 37 tables : 16 plates.

The third edition of Professor Stiles's book *Trace elements in plants and animals* is confined more closely to plants and the title has been changed accordingly. In the historical introduction we read of an astonishing list of elements which, one by one, have been shown to be necessary for plant growth, finally arriving at the statement that "on the whole any element will stimulate the growth of algae at a definite concentration which depends on the element and the species." Many elements seem to be essential for growth of all species, including vascular plants, algae and fungi, whereas others have been shown to be required by certain species but whether they are necessary for all plants only future work can decide.

The book gives a most useful account of the methods of detecting trace-element deficiencies and of some of the most prevalent diseases that may be caused in agricultural and horticultural plants by deficiencies of manganese, zinc, boron, copper, molybdenum and chlorine; some of the symptoms show strong resemblances to certain virus diseases. Effects of excess are also described.

In a discussion of the functions of trace elements, their close connexion with enzyme systems is pointed out and evidence is adduced to show the role of at least some of them in the development of disease resistance in plants and vitamin formation in animals.

4060 Lewis, D. (Editor).
Digestive physiology and nutrition of the ruminant.
Butterworths, London 1961 : 50s. : Pp. ix + 297 : figs. : tables.

The seventh Easter School of Agricultural Science at the University of Nottingham [cf. XXX, 2152] was devoted to the nutrition of the ruminant. Since this is carried out in such large measure by microorganisms, botanical readers will, after the first shock of entering the rumen, be surprised to find themselves quite at home; particularly in the discussion by L. A. Davey and C. A. E. Briggs on Descriptive microbiology of the rumen, where we read of difficulties in classifying the organisms within the framework of classical bacteriological taxonomy and the need to establish new species in the existing genera and even a few new genera too. Thus we are introduced to *Succinomonas*, the type species of which, *S. amylolytica*, is "an anaerobic, Gram-negative, non-spore-forming organism which ferments carbohydrates, producing large amounts of succinic and some acetic acid". New species include *Cillobacterium cellulosolvens*, which displays affinities with *Cellulomonas* and *Brevibacterium* and also with the Lactobacillaceae. Another is *Methanobacterium ruminatum*, an unwanted species producing methane. Many complex cases of symbiosis are cited.

P. N. Hobson spoke on Techniques of counting rumen organisms and J. C. Shaw on Techniques for studying rumen metabolism with special reference to the use of radioisotopes. Other contributions are more directly concerned with physiological aspects of the nutrition of the animal.

4061 Sasser, J. N. & Jenkins, W. R. (Editors).
Nematology.
North Carolina University Press. London : Oxford University Press 1961 : 100s. : Pp. xv + 480 : figs. : tables.

This volume is the outcome of a series of lectures delivered to a group of postgraduate students of phytonematology during a five-week seminar at North Carolina State College in 1959. It is divided into sections dealing with methodology; morphology and anatomy; selected nematode groups; physiology and biochemistry; genetics and cytology; ecology; host-parasite relations; and control methods. Readers of *Plant Breeding Abstracts* will probably be most interested in two of the chapters included in the last section, namely Mechanisms of resistance to plant-parasitic nematodes by R. A. Rohde and Some problems and progress in the breeding and selection of plants for nematode resistance by E. L. Moore. Another particularly valuable contribution consists of an 80-page paper by R. D. Winslow of Rothamsted on Some aspects of the ecology of free-living and plant-parasitic nematodes.

It is pointed out in one of the chapters that in Europe full courses in phytonematology are at present delivered only at Imperial College, London, and at the Landbouwhogeschool, Wageningen, Netherlands. It may be conjectured that the lack of an up-to-date, comprehensive, authoritative textbook is partly responsible for this anomaly. *Nematology* will no doubt fill this gap most admirably; quite apart from the eminence of the contributors, the scope of the bibliographies, the clarity of the illustrations, and the quality of paper and print are of a standard seldom surpassed in books dealing with agricultural science.

4062 Steinhaus, E. A. & Smith, R. F. (Editors).
Annual review of entomology. Vol. 6.
Annual Reviews, Inc., Palo Alto, California 1961 : $7.50 : Pp. vii + 470 : figs. : tables.

The sixth volume [cf. XXX, 3375] begins with a contribution by J. E. and C. L. Remington on Darwin's contributions to entomology; with apt citations they show how much Darwin influenced entomological thought by stimulating enquiry and finally imposing the ideas of natural selection and evolution.

H. B. D. Kettlewell writes on that much-disputed topic, industrial melanism in Lepidoptera. It is pointed out that melanism is a phenomenon which occurs in nature without industrialization; a review of early investigations shows their many experimental shortcomings. Evidence is however produced to prove that the melanic forms have a selective advantage in areas of pollution. Melanic forms are shown to occur regularly in a wide range of species and can at any time provide material for natural selection. Many gaps in present knowledge of the chemical, physiological and other aspects of the phenomenon are mentioned. In Nutritional factors in insect resistance to chemicals, H. T. Gordon discusses some of the interrelationships that exist between host plants and their insect parasites, particular attention being given to the physiological reactions of resistant strains and their genetic control. The position is summarized as follows: "the origin of 'detoxication enzymes' from 'growth enzymes' may be correlated with the fact that most secondary plant substances act as growth inhibitors, not fast-acting nerve poisons. Natural selection has therefore favored enzyme structures that are unspecific enough to destroy many of the diverse structures occurring in the natural growth inhibitors, and variation in the food plants probably preserves a variety of alleles of varying specificity within the insect population. Selection of these, probably with modifiers that augment their viability, accounts for the surprisingly rapid (on the evolutionary time scale) adaptation to contact insecticides. Since these alleles function well in normal growth, their selection has an aspect of unspecificity, cumulativeness, and permanence that may hinder, and will certainly complicate, the future progress of chemical control".

Other contributions include reviews on sampling crop pests and their hosts, ecological aspects of plant virus transmission and the study of natural insect populations.

4063 Frost, S. W.
Insect life and insect natural history.
Dover Publications, Inc., New York : undated : 2nd Ed. : $2.25 : Pp. viii + 526 : 406 figs. : tables.

Although intended primarily for elementary university classes in entomology, this well-illustrated volume should prove of considerable interest and value to botanists who wish to brush up their knowledge of the subject without having to spend excessive time and effort in

assimilating the minutiae of insect taxonomy, anatomy and physiology. The author, who is Professor Emeritus of Entomology at Pennsylvania State University, combines an encyclopedic knowledge of his subject with an aptitude for presenting information in an entertaining, yet scholarly and well-organized manner. Together with details of the origin, distribution, systematics, physiology, morphology and economic significance of insects, the reader is provided with fascinating information on the short-circuit beetle, which is able to bore through lead cables, on the contribution of insects to music, graphic art, medicine and the human diet, and on the influence of temperature on the rate of chirping in crickets! The last few chapters, which deal with the life cycle and mode of action of subterranean, boring, gall, leaf-rolling and leaf-mining insect pests, will no doubt be particularly useful to readers of *Plant Breeding Abstracts.* The value of the book is enhanced by a chapter-by-chapter bibliography which includes 1300 references, though they are mainly of North American origin.

4064 Smith, K. M. & Lauffer, M. A. (Editors).
Advances in virus research. Vol. 7.
Academic Press Inc., New York and London 1960 : $10.00 : Pp. ix + 397 : figs. : tables.

One of the reviews in the seventh volume [cf. XXIX, 3315] by J. H. Hitchborn and A. D. Thomson, deals with Variation in plant viruses. The existence of different strains is now recognized as the rule and not the exception and various criteria whereby strains may be identified are discussed; serological tests have been found to be the most reliable so far. Strains seem to differ in their mutation rate. In tobacco mosaic virus and certain others chemical differences between strains have been demonstrated; these may involve proteins, aminoacids, nucleotides and other constituents; electrolytic differences probably connected with protein surfaces have also been detected, as well as differences in certain morphological features and in host range, insect transmissibility, inactivation and infectivity. Though much of the evidence for the origin of strains by mutation is admittedly inconclusive, cases where the possibility of selection seems to have been excluded are cited. Similarly with the origin of new strains by genetic recombination: some of the claims made are viewed sceptically, though some appear to be accepted.

A. Klug and D. L. D. Caspar write on The structure of small viruses, taking tobacco mosaic virus (TMV) as the model. Much of the knowledge is based on X-ray analysis and the principles and techniques involved are elucidated. The structural characteristics of TMV are described in detail and we are told of a helix with 49 subunits in three turns, of a particle length of some 3000 Å, and of a molecular weight of about 39 x 10^6, the virus consisting entirely of protein and RNA, the RNA fraction amounting to some 5%; there is an axial hole occupied by solutes, the shape of the protein subunit being such that it protrudes at both inner and outer surfaces; the spaces between the subunits are large enough to be penetrated by small but not by large molecules; the folding of the polypeptide chain of the protein subunit apparently enables it to accommodate the 157 aminoacids in the chain. All this is, however, said to be "highly inferential". Available data for other helical viruses suggest that some strains at least of cucumber virus are so closely related to TMV as to suggest a common origin. The properties of the protein component are described in full; we learn that the protein subunit packing is very little changed in the absence of RNA and that the RNA molecule does not run through the middle of individual protein subunits, but rather that the subunits pack together in such a way as to leave space for the RNA between them; the RNA is in a single strand, comprising 6400 nucleotides, inactivation of any one of which suffices to rob the RNA of its infectivity alterations in the sequence of nucleotides may be lethal, mutagenic or without observable effect. Many of the so-called "spherical" viruses have proved to be symmetric polyhedra; their RNA nevertheless seems to be located in a central core. Certain special properties are examined and those viruses which have been most studied are described in turn, analogies with TMV being pointed out; much analogy in structure seems to exist and in all cases it seems that the configuration of the RNA is determined by its packing with the protein; the process whereby the two come together is referred to as a kind of "co-crystallization" of two very unlike components, the reverse process being presumably involved in infection.

Other reviews in this issue deal with the biology of soil-borne plant viruses and density-gradient centrifugation of plant viruses; the remainder are concerned with animal viruses.

4065 Roemer, T. & Rudorf, W. (Editors). Handbuch der Pflanzenzüchtung. **(Manual of plant breeding).** Paul Parey, Berlin & Hamburg 1961 : 2nd Ed. : Lief.42/43 : Vol. 5 : Bogen 26–31 : 401–494 + xxiii; Lief.44 : Vol. 6 : Bogen 26–30 : 401–80; Lief.45 : Vol. 6 : Bogen 31–35 : 481–560 : figs. : tables : DM 13.50 each.

Instalments 42–3 [cf. 1158] complete the section on medicinal plants in volume 5. Various causes of variability are examined and the difficulties in distinguishing between genetic and environmental variation are explained; a number of cases are nevertheless cited in which clear genetic differences between races or individuals in the alkaloids or other constituents have been established, either in respect of their amount or their composition. However, the author is not in favour of applying the term "chemical race" when the differences are only quantitative. In regard to polyploidy, it is shown that increases in chromosome number often lead to higher drug content but this is frequently, though not always, offset by reductions in yield. Heterosis effects are exemplified by the hybrid *Lavandula officinalis* x *L. latifolia*. The rest of the volume is devoted to a review of information on individual species under headings such as systematics and cytology, variation, reproduction, influence of polyploidy, hybrids, proportions of different alkaloids, cultivars and breeding; a bibliography is appended to the review of each species. The species dealt with include *Datura stramonium, Atropa belladonna, Claviceps purpurea, Digitalis purpurea, D. lanata, Mentha* spp. and *Valeriana officinalis*. The volume ends with the usual indexes, prefaces and title pages.

Instalment 44 completes the section on beans in volume 6 and continues with Gemüseerbsen (*Pisum sativum* L. sensu lat. Gov. ssp. *sativum*) [Garden peas (*P. sativum* L. sensu lat. Gov. ssp. *sativum*)] by J. M. Andeweg and E. Kooistra, who review information on centres of origin, systematics, cytology, biology of flowering, crossing technique, and variation and inheritance of characters in different parts of the plant. The results of breeding for various properties, including a variety of diseases and pests, are outlined. Among the achievements of breeding, special mention is made of the Strålärt [Ray pea] produced by irradiation in Sweden.

The volume continues with Obst-Züchtung [Fruit breeding], the first chapter of which, devoted to *Ribes* L., is contributed by a group of authors. F. Nilsson deals with systematics, cytology, biology of flowering and genetical interrelationships of the species, a number of interspecific hybrids being described and illustrated. R. L. Knight and E. Keep write on the subgenus *Coreosma*, reviewing the results of breeding for a number of different characters, and R. Bauer deals on similar lines with subgenera *Ribesia* and *Grossularia*. In the section on *Rubus* L., continued in instalment 45, R. L. Knight and E. Keep deal with systematics, cytology, floral biology and seed formation and F. Gruber with Grundlagen und Methoden der Züchtung [Bases and methods of breeding] in subgenera *Idaeobatus* and *Eubatus*, giving a table of the main blackberry and dewberry varieties released during the last 30 years, with details of their origin, ploidy and main properties. G. M. Darrow deals with breeding *Vaccinium*, covering information on systematics, flowering, breeding methods and results, the chief cultivars grown in the USA being listed. In the section on *Fragaria*, F. Gruber deals with systematics, cytology, origin, floral biology and breeding in what is referred to as "subgenus *F. vesca semperflorens*", R. Bauer deals with "subgenus *R. ananassa*". In the section devoted to Baumobst [Tree fruits], H. M. Tydeman deals with rootstocks in apples, pears and cherries.

4066 Vavilov, N. I. **(Collected works).** Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad 1960 : **2** : **33** r. 60 k. : Pp. 519 : figs. : tables : 1 map.

The second volume of the collected works of N. I. Vavilov [cf. XXVIII, 3576] begins with essays on plant breeding as a science and on the geographical method in plant breeding, both reprinted from the *Theoretical bases of plant breeding* published in 1935 [cf. VI, p. 327]. The next essays, on the cultivated plants of the Hiva oasis, on the role of Central Asia and of Mexico and Central America in the origin of cultivated plants are reproduced from the *Trudy prikladnoj Botaniki, Genetiki i Selekcii* (*Bulletin of applied Botany, Genetics and Plant Breeding*) [cf. II, 209–10]. There follow an essay on the great agricultural cultures of pre-Columbian America and their interrelationships, reprinted from the reports of the State Geographical Society, and a series of essays on field crops of the Soviet south-east, on the wild relatives of fruit trees in Soviet Asia and the Caucasus, on the geography and systematics

of the soft wheats and on the origin of smooth-awned barleys, all reproduced from *Trudy prikladnoj Botaniki, Genetiki i Selekcii.* Next comes an essay on interspecific and interspecific hybridization, reproduced from *Priroda* [cf. IX, 979], and lastly a study on intraspecific hybrids of melons and pumpkins, reproduced from *Trudy prikladnoj Botaniki, Genetiki i Selekcii.*

4067 Ochse, J. J., Soule, M. J., Dijkman, M. J. & Wehlburg, C.
Tropical and subtropical agriculture.
The Macmillan Company, New York 1961 : 1 & 2 : £12 5s. : Pp. 1446 : 285 figs. : 103 tables.

Intending their book not only for college students but also for such readers as plantation managers, technicians and administrators, the authors have certainly succeeded in their aim of collecting together information on selected tropical and subtropical crops and allied subjects in "brief yet reasonably comprehensive form." Although any book with such a wide coverage is bound to meet with criticisms concerning omissions and inclusions, largely dictated by the particular field of the specialized knowledge of the reader, this volume may be recommended as one containing a formidable amount of information on crops grown in all the tropical and subtropical areas of the world, while at the same time giving suitable background knowledge for a sound understanding of the general problems of the cultivation of field and horticultural crops in these regions.

The first portion deals with climatic factors, formation of soil, chemical and physical properties of soil and soil organic matter, soil fertility, soil management, cultural practices, the principles of breeding, economic considerations and the food value of tropical products. The remaining three quarters of the work are devoted to accounts of the various crops, which have been chosen partly on the basis of their world-wide significance and partly so as to represent different areas of the tropics and subtropics. In a number of cases, notably fruit crops, species virtually unknown outside a limited region have been included because of their merit. On the other hand, species of equal promise have sometimes unavoidably been excluded because of the limitation of space. The description of each crop follows a similar pattern of information on world production and other general aspects, botany, varieties, breeding (in cases in which this is considered to have reached sufficient status for inclusion), climatic and soil requirements, cultivation, harvesting, processing, uses, and diseases and pests. Some or all of these sections have been combined in the case of minor crops. In others, additional ones on such matters as floral biology, pollination or future developments have been added. As in the general part, selected bibliographies are to be found at the end of the chapters. Some oil, fibre and other crops have been purposely dealt with shortly, since they are grown so extensively and under such diverse conditions that adequate treatment of them would necessitate separate volumes; the suggested further reading remedies this appropriate brevity. The book is competently illustrated by photographs, drawings and clear, simple diagrams. The subject index is reliable and a glossary, author index and separate index of common plant names are also provided.

4068 Zimmermann, K. F.
Praktische Pflanzenzüchtung. (**Practical plant breeding**).
Gustav Fischer Verlag, Jena 1961 : DM 18.30 : Pp. viii + 231 : 42 figs. : tables.

The object of this volume is to provide a guide to plant-breeding methods for students and young breeders in the German Democratic Republic (DDR), where conditions and methods are in many respects different from those in Federal Germany and other parts of western Europe. Emphasis is placed on the need for the plant breeder to have a knowledge of a number of subjects such as botany, physiology and even chemistry and physics, rather than being merely an "applied geneticist". After an historical outline of the development of plant breeding from the earliest times, with a special section on plant breeding and seed production in eastern Germany, an account is given of some of the varied requirements that must be met by modern varieties and hence taken into consideration by the breeder. In a chapter on the modes of plant propagation the laws of inheritance and the role of the chromosomes are defined and a brief reference is made to cytoplasmic inheritance and Lysenko's theory; a full treatment of the latter is not deemed necessary since it rests on concepts that cannot be demonstrated by experiments, in which connexion the work of Stubbe and others is cited [cf. XXV, 2487, XXVI, 1146, XXIX, 2285]. The importance of environmental modification is seen only in the degree to which it may mask genetic variation. Various means

whereby this variation may be increased are discussed. The use of wild populations is not thought to have led to the improvements expected of it, except perhaps in the case of forage plants. Other methods considered are inbreeding and the induction of polyploidy and artificial mutations. The various methods of selection employed in plant breeding are described in considerable detail, separate sections being devoted to selection for winter hardiness, drought resistance, photoperiodic reaction and disease resistance. The basic statistical methods used in testing breeding lines and the procedures used in different systems of breeding are explained with the use of diagrams and a table is given indicating the most appropriate systems to be used for any given crop.

In describing the equipment used in plant breeding, details are given of various specially designed machines suitable for sowing single plots, single rows or single seeds, for cultivating between the rows, for threshing single plots and single plants and for weighing in the field, as well as various calculating machines. Various other tasks of the plant breeder are described, among these being the maintenance of stocks of self and cross-fertilized crops, the production of hybrid seed, certification and testing of new varieties, and, finally, seed testing.

Full details are given of the organization of plant breeding in the DDR; all the state and private institutes are named and information is given on their history, main activities and staff. A table lists the species of agricultural and horticultural plants of which cultivars have been approved in the DDR; another indicates the institutes at which the respective species are being bred. There follows a brief outline of breeding work that is being carried out in Hungary, Bulgaria, Federal Germany, the USA, Sweden and the Netherlands.

Among the achievements to be placed to the credit of plant breeders the author mentions domestic potatoes, sugar beet, sweet lupins and modern cultivars of many fruits. On the other hand, careful comparisons of a number of grass cultivars with the respective wild species have revealed no clear superiority in yield. Future advances in plant breeding are expected to accrue from the application of modern techniques such as induction of polyploidy and artificial mutations, provided the work is carried out on large populations, for which purpose international cooperation is recommended.

Particularly promising results are envisaged from the application of these methods to forage species.

4069 36e beschrijvende rassenlijst voor landbouwgewassen 1961. (**36th descriptive varietal list of field crops, 1961**). Rijkscommissie voor de Sammenstelling van de Rassenlijst voor Landbouwgewassen, Wageningen 1960 : f. 2.00 : Pp. 336 : tables.

The main body of this volume resembles that of previous volumes [cf. XXX, 4538], giving descriptions of, and tabulated data on, the crop varieties approved for growing in the Netherlands. The English supplement, however, has been revised and expanded and in its new form provides an improved guide to the contents.

4070 **Indian tobacco.** Indian Central Tobacco Committee, Madras 1960 : 72s. : Pp. xxi + 413 : figs. : tables : plates.

This monograph has been compiled as the result of the cooperative work of the entire personnel of the Indian Central Tobacco Committee, which was established in 1945 to assist in research, production and marketing. It is divided into three parts. Part I comprises an introductory chapter on various aspects of tobacco production in India, which includes an account of the history, organization, aims and achievements of the committee, and 12 chapters respectively dealing with: soils and climate; taxonomy; morphology, anatomy, sporogenesis and embryology; cytology and cytogenetics; genetics and breeding; physiology; agronomy; organic chemistry; diseases; insect pests; methods of curing; and seed multiplication. Throughout, reference is made to research and practices in other countries. The chapters on cytology and cytogenetics and on genetics and breeding are among the most comprehensive in this part, which also gives detailed descriptions of varieties. The second section is concerned with all aspects of the production of the different types in India, its five chapters dealing with (1) flue-cured, (2) bidi, (3) cigar and cheroot, (4) hookah and (5) chewing and snuff tobacco. Marketing in India is the subject of part III. Many of the photographs are of a very low standard, and the index does not inspire confidence. The monograph might also be criticized for the arrangement of its subject matter, which has led to a fair amount of repetition of information in the first two parts. These faults, however, can be overlooked if one considers the value of having so much hitherto scattered information on the complexities of tobacco production in India at last available in a single work.

4071 Fabiani, L.
La patata. (**The potato**).
Edizioni Agricole Bologna 1959 : L. it. 500 : Pp. 143 : 66 figs.

This small booklet on the potato starts with a very brief and not entirely accurate account of the history of the introduction of the domestic potato into Europe and gives details of present-day areas of cultivation and yields in different countries of the world and in Italy in particular, with indications of the varieties grown. Up to the year 1925 the potatoes grown in Italy were almost exclusively local varieties; these have now disappeared almost completely, replaced by imported varieties such as Early Rose, Eersteling, Marjolin, Up to Date, Bintje, Majestic and Böhms allerfrüheste Gelbe [Böhm's Yellow Earliest-of-all], known locally as Tonda di Berlino [Berlin Round]; more recently by an Italian cultivar San Michele [cf. XXIII, 1287]. The attributes used in varietal diagnosis in the potato are described, the differential reaction of cultivars to photoperiod and other environmental factors is explained and figures are given showing the starch content of a number of cultivars grown in Italy. The various diseases of the potato due to attack by virus, fungi and insects and to physiological disturbances are described and the principles of potato cultivation, for seed production and in general practice, are explained. In a final chapter on the variety problem the view is expressed that the varieties being produced today are too restricted in range of adaptation and inferior in quality to the old-fashioned cultivars. A great number of varieties are named which have been grown in Italy for a certain time and then given up for one reason or another; once again the special merits of certain old varieties such as the French Marjolin and Belle de Fontenay, the Austrian Kipfler and the Italian Matilde are commented upon and Italian growers are urged to pay more attention to the production of potatoes of high quality.

4072 Hogen Esch, J. A., Nijdam, F. E. & Siebeneick, H.
Dutch potato atlas. Third supplement.
H. Veenman & Zonen, Wageningen undated : f. 11.25 : unpaginated : plates.

This new supplement, like its predecessors [cf. XXIX, 3323], gives detailed descriptions and full-page coloured illustrations of varieties recently admitted to the Netherlands varietal list [cf. XXX, 4538]. These varieties are: Aristo (Eigenheimer x Flava); Asoka (Saskia x Sirtema); Dekama (I.v.P. 354 x Libertas) [cf. XXVIII, 4388]; Harli (Record x Black 834); Herkol (Record x Kapenga 37–85) and Pandora (Furore x Fransen) [cf. XXVIII, 4388]; Patrones [(Bintje x Record) x (Black 581 x Alpha)]; and Remona [*Solanum demissum* x Frühmölle x Opperdoese Ronde x Flava x (Frühmölle x Erika)].

4073 Neagu, M. I.
Selecția plantelor hortiviticole. (**The breeding of horticultural plants and vines**).
Editura Agro-Silvica de Stat, București 1960 : Lei 31,20 : Pp. 515 : 51 figs. : 40 tables.

In the Soviet Union today, Mičurinist principles of genetics and breeding are widely accepted, though it has become clear that many research workers view them with considerable scepticism. Elsewhere in eastern Europe, notably the German Democratic Republic, Mičurinism is largely discredited. In Rumania, however, Mičurinism appears to be enjoying an Indian summer, especially in the domain of horticulture, and of this phase, the book under review is a fitting monument.

Professor Neagu sets out to survey the potentialities for breeding the principal fruits and vegetables of Rumania, and he succeeds in giving a clear and systematic description of current horticultural breeding programmes in his country. For each crop, after a preliminary account of its floral biology and pollination requirements, the technique of hybridization is described and then the initial material available for breeding. These preliminaries are followed by a schedule of breeding objectives, breeding methods, and the principal results so far achieved in Rumania and elsewhere.

The crops covered are vine, apple, pear, quince, plum, sweet and sour cherries, peach, apricot, walnut, strawberries, *Ribes* spp., *Rubus* spp., tomato, *Allium*, carrot, pea, bean, lilac, *Dahlia* and *Gladiolus*.

One of the most useful features of the book is provided by the tables of varieties under each crop. These describe the principal horticultural cultivars of eastern Europe and bring together information not otherwise easy to obtain. The breeding techniques comprise the gamut approved by Mičurinists, including vegetative hybridization, hybrid training and intravarietal crossing. For the vine, special attention is paid to clonal selection, a topic especially investigated by the author [cf. XXVII, 3802]. The breeding

achievements mentioned are overwhelmingly those of the Soviet Union and Rumania.
The value of this book as a compendium of current Rumanian horticultural breeding programmes has already been noted. It is disconcerting however, at a time when science reputedly knows no frontiers, to find so rigid a restriction of viewpoint. The numerous recent achievements of western European and American horticultural breeders receive hardly a mention. Chromosomes, genes and polyploidy are taboo. The bibliography is almost exclusively of Russian and Rumanian titles. A work of Bunyard (1911) appears in English, but Crane and Lawrence's classic [V, p. 270] and even Burbank's works are only cited from Russian translations.

4074 González-Sicilia de Juan, E.
El cultivo de los agrios. (**The cultivation of citrus fruits**).
Inst. Nac. Invest. Agron., Madrid 1960 : Pp. 806.

This comprehensive volume on fruit crops belonging to the genera *Citrus*, *Poncirus* and *Fortunella* includes sections dealing with origin, distribution, environmental requirements, cultivated varieties and hybrids, morphology and anatomy, physiology, genetics and varietal improvement, manuring, irrigation, pests and diseases and all aspects of cultivation practice. The bibliographies appended to each of the 20 chapters include references from virtually all the major citrus-growing areas of the world. The volume should prove of great value to Spanish-speaking research and advisory workers dealing with citrus crops.

4075 Stern, K.
Plusbäume und Samenplantagen. (**Plus trees and seed nurseries**).
J. D. Sauerländer's Verlag, Frankfurt am Main 1960 : DM 10.20 : Pp. 116 : figs. : tables.

If anyone should think that the improvement of forest trees by selection of superior (plus) trees is an easy business, they should read this booklet. Its primary object is to explain the principles of population genetics and to point out to what a surprisingly small extent these principles have been taken account of in projects of breeding forest trees. The system of selection adopted in Sweden is considered the most rational and is described, largely on the basis of accounts published by Andersson [cf. XXVIII, 2267].
A few cases of simple inheritance of characters in forest trees are mentioned, though most features that interest the breeder are polygenic; the principles of polygenic inheritance and the methods of estimating genetic variance and regression coefficients are explained, the limitations attendant on the difficulty of making progeny tests with most forest trees being pointed out. Rational plant breeding, based on modern genetic principles, has only been applied to forest trees in the last 15 years or so in Europe and the author shares the opinions of Barner that it is too early to judge its effectiveness. Genetical experiments have demonstrated the existence of variation in respect of a number of characters in forest trees but little information is available so far concerning the improvements that can be expected from selection in relation to the expense involved.
Various types of crossing programme are considered and the use of a diallel-cross scheme for the calculation of general combining ability is illustrated by a cross with one-year-old birch clones. Attention is called to the lack of accurate experiments on the basis of which the best size of plots, number of replications, clones and crosses and other details can be decided in experiments with forest trees. The opinion is expressed that 1–2 replications in a number of different locations are preferable to a larger number of replications at a single location. It is assumed that about 200 clones will have been selected from each typical locality in the first place and be subjected to multiple-stage selection, the yields of the selections being compared with the mean yield of the progenies of a number of plantations recognized as good seed sources. Though, again, experiments on the subject are lacking, the measurement of growth according to the metameter system of Rao is thought to be practicable.
The complicated interrelationships that exist between forest trees and other elements of the forest flora and the environment, treated under the heading competition, constitute another relatively unknown factor affecting the result of comparisons between progenies and the very arbitrary genetical basis of many of the methods of early testing, such as clone testing, is emphasized. An explanation is given of the calculation of selection indices, the value of punched card machinery for working out the results is mentioned and breeders using these methods are warned not to make the data recorded in them too one-sided, since the results of careful progeny tests, *when* they become available, may throw new light on the characters

for which selection can most profitably be effected.
The booklet is provided with a bibliography embracing a wide range of works devoted to many different aspects of the topics considered.

4076 Fröhlich, H. J.
Jungwuchspflege und Läuterung mit synthetischen Wuchsstoffen. (**Care of young plantations and thinning with synthetic growth substances**).
J. D. Sauerländer's Verlag, Frankfurt am Main 1961 : DM 5.80 : Pp. 56 : figs. : tables : plates.
Strong arguments are adduced for effective thinning in order to preserve the trees with the best genotypic constitution. Experiments have shown that thinning can now be effected by means of growth substances. Solutions of 1·5–3% of Tormona 100 have proved effective, the exact concentration varying according to the species. The methods of application and the effects are described; the costs are shown to be considerably lower than those for hand thinning and various other advantages are discussed in this attractively presented booklet. A table shows the most suitable methods of application, concentration and dosage for the main species of forest trees and shrubs.

4077 Brežnev, D. D. [Editor].
(**Varieties of vegetable crops in the USSR**).
Gosudarstvennoe Izadtel'stvo s.-h. Lit., Moskva, Leningrad 1960 : 25r. 40k. (2r. 54k.) : Pp. 536 : figs. : plates. [Russian].
The size and complexity of the Soviet Union must present formidable difficulties to anyone attempting to provide comprehensive coverage of any agricultural or horticultural topic. The present volume, produced through the co-operation of a large number of horticulturalists and botanists, does succeed in providing a full account of the principal features of 25 vegetable crops and several hundred of their main varieties. It should prove to be a most useful asset to the libraries of colleges, institutes, state farms and collectives in the Soviet Union and neighbouring countries. The following aspects of each crop are discussed at some length: importance of the crop; biological requirements for high yields; the main breeding objectives; floral biology; disease resistance; and inter-varietal and interspecific variation. The scope of the volume is illustrated by the fact that descriptions are given of 70 varieties of cabbage, 76 varieties of onion and 101 varieties of tomato. These descriptions include information on the origin of the variety, area of adaptation, maturity period, yield potential, chemical composition and morphological characteristics. The book is illustrated by photographs and full-colour drawings; most of the latter are excellent but the photographs are, in general, of poor quality.

NEW JOURNALS

The Ceylon Coconut Planters' Review

This new quarterly, which first appeared in July 1960, is designed to provide information of practical importance to the coconut planters of Ceylon. The journal is published by the Coconut Research Institute of Ceylon, Bandirippuwa Estate, Lunuwila, Ceylon, the annual subscription being Rs. 5.00. The editor, Dr. M. L. M. Salgado, and his colleagues on the editorial board, will endeavour to "introduce matters of a scientific nature in non-technical language", and welcome appropriate articles and letters.

Crop Science

Published by the Crop Science Society of America, this new bimonthly journal is an offshoot of the Agronomy Journal. Crop Science will carry articles on genetics, cytology, physiology, ecology and breeding while the Agronomy Journal will concern itself mainly with plant-soil relationships, crop, soil and range management, agricultural climatology and agronomic education. Further information may be obtained from the Executive Secretary, 2702 Monroe Street, Madison 5, Wis.

Savremena poljoprivreda

The above monthly is published in succession to *Poljoprivreda Vojvodine* at Novi Sad. The subject matter deals with plant production, animal husbandry, agricultural methods, economics, statistics and meteorology and includes notes on conferences, summarized reports on research in agriculture and lists of recent Jugoslav literature on agricultural subjects. The first issue contains an article on introduction trials of Italian wheat cultivars which is summarized in this number of *Plant Breeding Abstracts*. Most articles are provided with summaries in English, German, French or Russian.
Further information may be obtained from Novi Sad, J. Đorđevića 2, Jugoslavia.

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